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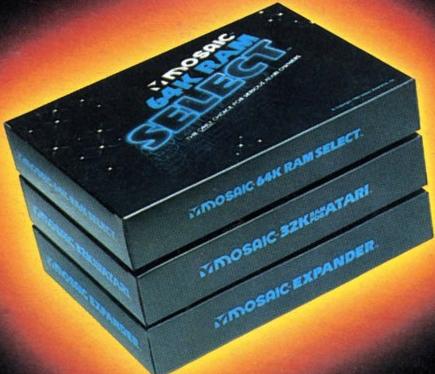


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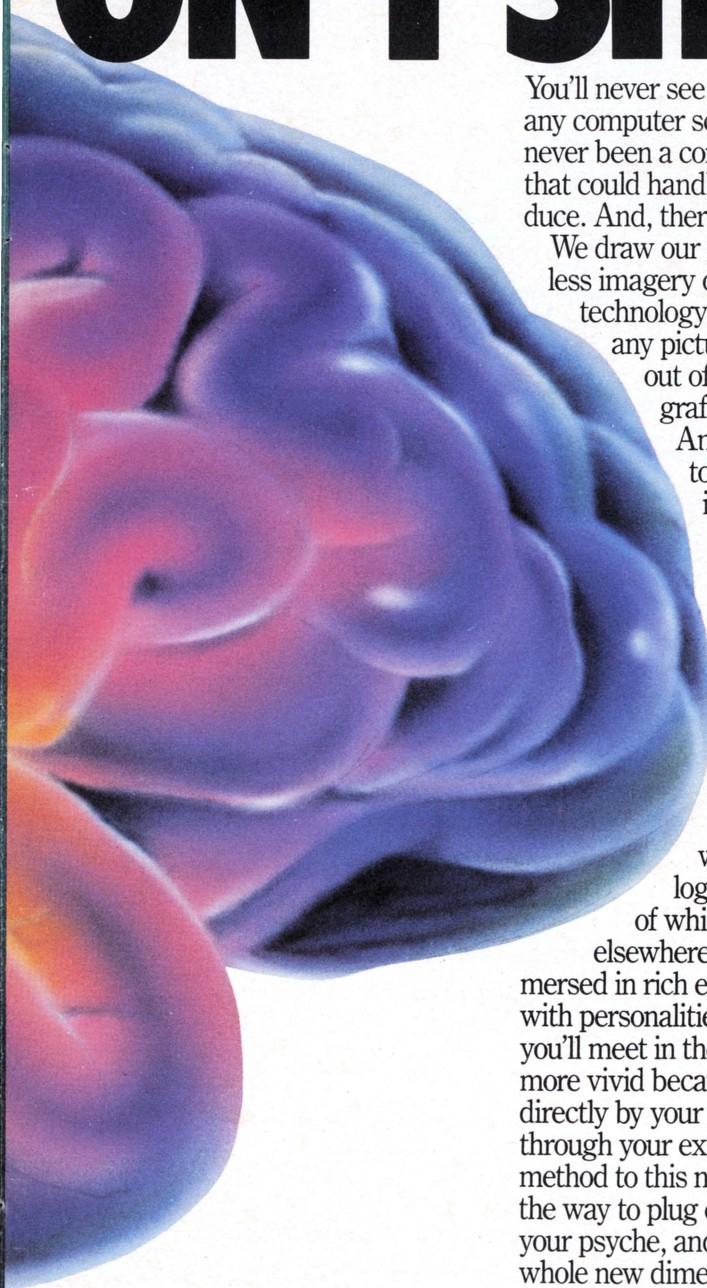


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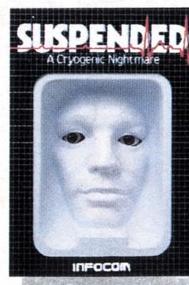
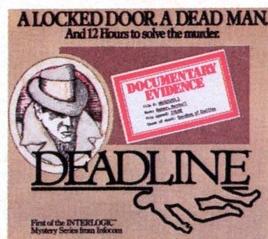
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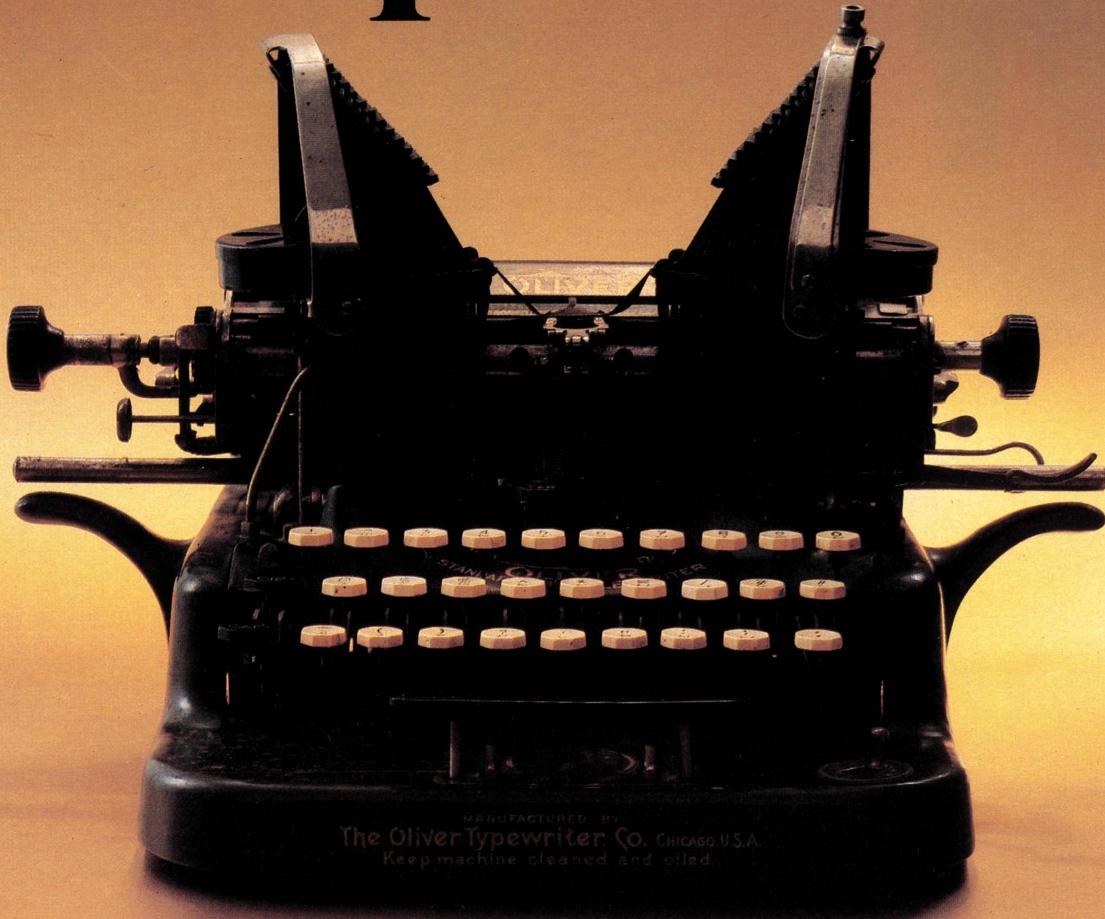


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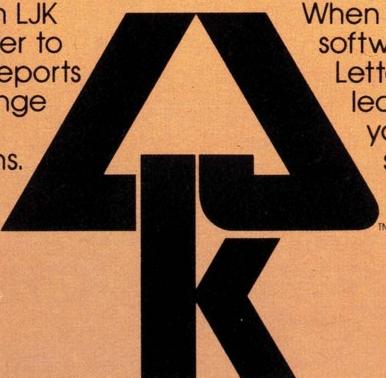


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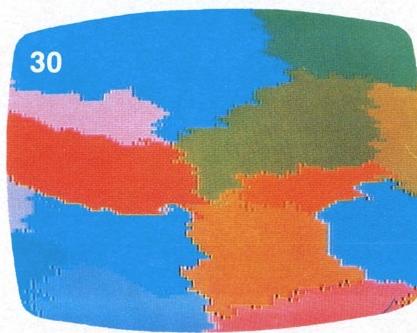
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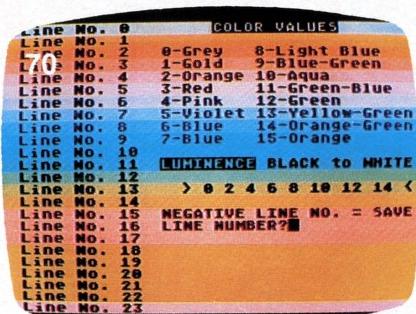
FEATURES/ARTICLES

The New ATARI Computers	Lee Pappas	35
De Re Letter Perfect	Arthur Leyenberger	43
ATARI Word Search.....	Marcy Caruthers	45
D:CHECK/C:CHECK and Control Characters	46	
Notes to the ATARI Microsoft Basic Instruction Manual	Gerald Despain	48
Our Game	Joel Gluck	98



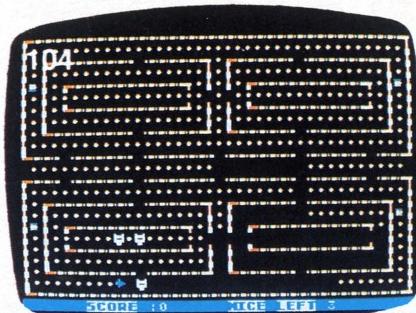
REVIEWS/PROFILES

Suspended	Brian Moriarty	64
ATARI Books Reviewed ...	Cris Popenoe & Lee Pappas	76
The Happy 810 Enhancement	Brian Moriarty	81
Database Programs	Richard Herring	87
Omnimon!	Brian Moriarty	101
The ALOG Pagewriter	Tony Messina	124
Bank Street Writer	Arthur Leyenberger	125



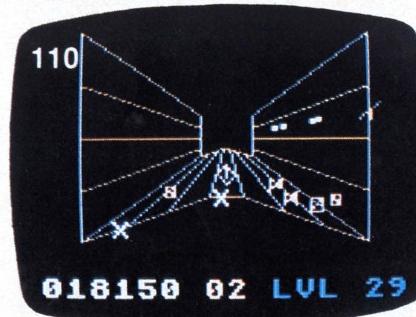
PROGRAM LISTINGS

Micropainter Pictures in BASIC	Tom Hudson	24
GTIA Expansion Demo	Andrew Katz	30
Sound Effector	Sheila Neece Spencer	40
From Rags to Riches	Bob Curtin	52
Multicolor Screen Generator	Richard J. Kalagher	70
Total String Search	Jerry Tucker	85
SNAIL	Brian Moriarty	94
ATARI's Multicolor Character Sets	Dave Plotkin	104
Livewire.....	Tom Hudson	110



COLUMNS

Editorial	Lee Pappas	8
Reader Comment.....		10
New Products	Marcia & Gary Rose	16
Index to Advertisers		132





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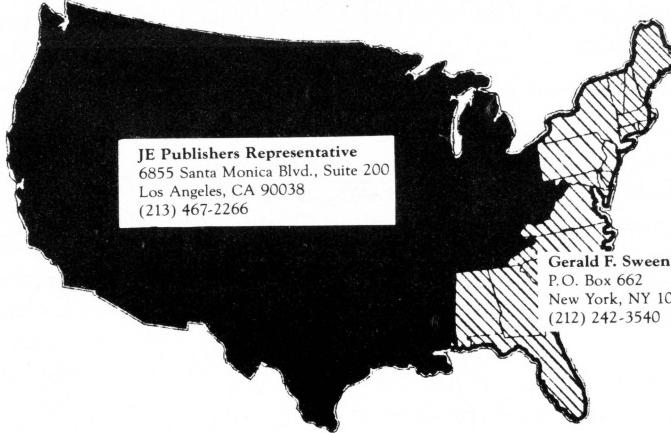
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ABOUT THE COVER . . .

The cover to this issue illustrates our arcade game Livewire. The cover was prepared by first taking several black and white photos of a monitor and an ATARI 800. The photos were stripped together to form a high-contrast composite, then the composite was shot as a large film positive. The positive was mounted on a sheet of glass, and the screen objects and "laser beams" were cut in. Color was added by taping various sheets of acetate to the back of the film positive. A sheet of diffusion material was then attached to the positive. The resulting artwork was illuminated by two movie lights. As with many of our covers, the light effects were a product of multiple exposures — including separate exposures for each element on the cover. In this case, there were 27 different elements, providing the colorful cover to issue no. 12 of A.N.A.L.O.G.

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EDITORIAL

by Lee Pappas

I would like to take this opportunity to answer some of the most frequently-asked questions that have recently been submitted to our offices.

Q: What is the meaning of your name A.N.A.L.O.G.?

A: When Michael and I came up with the idea of starting the first ATARI-only publication, one of the most difficult aspects of the magazine was coming up with a suitable name. Since DIGITAL Equipment Corporation is predominant in our area (their headquarters is a half hour from our office), I jokingly suggested we call the magazine ANALOG (Amazingly, we have had people ask us if we know that an ATARI is a digital computer.) Michael then came up with A.N.A.L.O.G.; ATARI Newsletter And Lots Of Games.

Q: How do you print your program listings?

A: Our program listing method didn't just come about. A year ago, Charles Bachand wrote a custom program called, appropriately enough, LISTER, which has options to work with either C.Itoh or Epson printers. The program will print out all ATARI special graphics characters and inverse video. Our listings are printed 38 characters wide, the same format that they will appear in on your TV set if they are typed in correctly. This makes visual debugging of your typed programs easier. Our program listings are also printed out directly from working copies of the program. This helps to eliminate errors. While other listing methods are available, time has proven this as the most effective.

Q: Who writes the articles and programs in A.N.A.L.O.G.?

A: Roughly half of the editorial content in the magazine is produced by readers like yourself. I feel our publication, for its size, has the most talented staff of any computer magazine in the country. We are very lucky to have the services of Charles Bachand, Tom Hudson, Tony Messina and Brian Moriarty, who are among the most knowledgeable ATARI programmers in the field today, bar none. Our programs such as **Fill'er Up**, **Adventure In The Fifth Dimension**, **Maniac**, and **Livewire** are equal to, and in some cases better than, many commercially available pieces of software. Our utility programs ARE useful, our tutorials DO educate.

Q: What back issues are available?

A: Though several previous issues have been reprinted, at present only issues #2, & #7, and a limited supply of #9 & #10 are available. The **A.N.A.L.O.G. COMPENDIUM** will be ready shortly. This 160-page book will include the best programs and materials from the first ten issues, along with fresh material from the **A.N.A.L.O.G.** editorial staff. The **COMPENDIUM** will be spiral bound in 8½" x 11" format, will accept no outside advertising, and should be on sale at your favorite book or computer store August 1st.

Q: When is A.N.A.L.O.G. going monthly?

A: We have been contemplating going monthly since the publication of the first issue. Our first obligation is to our readers. When we feel that we can maintain the present quality of the magazine as a monthly publication, then we shall go monthly. With a bi-monthly circulation approaching 100,000, few of our readers have seen our total growth potential.

This issue of **A.N.A.L.O.G.** marks the end of our second year of publication. Michael DesChenes and I, along with the entire staff, would like to thank our readers, contributors, advertisers, and ATARI, for making **A.N.A.L.O.G.** what it is today: the first and best ATARI-only computer publication in the world. □

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READER COMMENT

Sir:

At the end of each marking period, teachers in my school are required to complete a grade report showing grade distribution for each section. I guess many other teachers also have this sort of paperwork. The program listed below accepts letter grades A through E, counts the entries, and figures percents. The program also totals these numbers for several sections. The program is written to accomodate classes of up to 50 students. More students can be allowed by changing the dimension of A in line 10. There is no limit on the number of sections that can be accumulated. Although the program was written for the ATARI, it should be relatively easy to translate for other computers.

Sincerely,
Jeff Meyers
Baltimore, Maryland

```
5 POKE 752,1:OPEN #2,4,0,"K"
10 DIM A(50),X(5),A$(1),Y(5),T(12):S=1:FOR I=1 TO 12
: T(I)=0:NEXT I
15 K=1:FOR I=1 TO 5:X(I)=0
: Y(I)=0:NEXT I:Y=0
20 ? "SECTION ",S;S=S+1:?
25 ? "GRADE ";K;" - ";:GET #2,A:?
CHR$(A):IF A=155 THEN 40
30 IF A<65 OR A>69 THEN 25
35 A(K)=A:K=K+1:GOTO 25
40 K=K-1:FOR I=1 TO K:A(I)=A(I)-64:X(A(I))=X(A(I))+1
:NEXT I
45 FOR I=1 TO 5:Y(I)=INT(.1
00*X(I)/K*100+.5)/100:Y=Y
+F(I):NEXT I
50 ? "K":? " SECTION # "
;S-1:?:?
55 ? "GRADE","FREQ","X":GOSUB 135
60 FOR I=1 TO 5:? CHR$(I+64),X(I),Y(I):NEXT I:GOSUB 135
65 ? "TOTAL",K,Y
70 FOR I=1 TO 5:T(I)=T(I)+X(I):T(I+6)=T(I+6)+Y(I):NEXT I
75 T(6)=T(6)+K
80 ? "ANOTHER SECTION ?":GET #2,A
```

```
85 IF A=89 THEN 15
90 ? "K CUMULATIVE":? ?:? :S
=5-1
95 FOR I=7 TO 11:T(I)=INT(.1
00*T(I)/5+.5)/100
100 T(12)=T(12)+T(I):NEXT I
105 ? "NUMBER OF SECTIONS
= ";S;? ?:?
110 ? "GRADE","FREQ","X":GOSUB 135
115 FOR I=1 TO S:? CHR$(I+64),T(I),T(I+6):NEXT I:GOSUB 135
120 ? "TOTAL",T(6),T(12):?
?:? ?:? "START OVER (Y/N)":?
:GET #2,A
125 IF A=89 THEN RUN
130 POKE 752,0:? "K":END
135 ? "-----":RETURN
```



CHECKSUM DATA (See p.46)

```
5 DATA 320,600,572,728,908
,185,937,930,988,236,266,8
86,436,743,741,9476
80 DATA 460,357,195,254,44
1,711,40,120,459,822,315,3
29,4503
```



Dear Sirs:

I would like to make a comment about Mr. Randall Beemer's letter in A.N.A.L.O.G. No. 11. It is pathetic to see some of the people in this world who just cannot appreciate anything or admit their own mistakes. For example, I am a head photographer in my high school. When everything is smooth, no one says a word, but when you make a mistake, you'll hear it until you're sick of it and start to talk back.

I bought my 800 only three months ago, yet I'm proud to claim that I'm on my way to becoming a computer "pro." I understand how programs work, and have begun to write some of my own. Where else could I have learned so much in such a short

time? I know that it's a rhetorical question, but the answer is A.N.A.L.O.G. When I first started, A.N.A.L.O.G. programs didn't work for me either. However, you don't start driving racing cars until you've learned how to drive a car. It's the same with programming. You start with small programs like "Guess My Number" and gradually move up to a 1K program. If it works, then move on to a 2K program and so on.

Notice how A.N.A.L.O.G.'s program listings match up to the screen perfectly. Even special graphic characters are there. So far, A.N.A.L.O.G. is the only magazine for ATARI that has

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program listings which "synchronize" with the screen. This makes it many times easier to visualize just where you are in the program. If you take a straight edge and place it across the program so that only one line can be viewed at a time, your eyes will be less confused. Therefore, your eyes will read more accurately. Finally, I'm happy to say that An Adventure Game, The Halls of The Leprechaun King, and Fill 'Er Up worked flawlessly as listed.

In conclusion, if anyone refused to subscribe to A.N.A.L.O.G. and have an ATARI computer, they're on a diet for knowledge. I personally thank the A.N.A.L.O.G. staff for sharing so much of their knowledge with me at an unbeatable price. To refuse A.N.A.L.O.G. is maddening, not "sitting for four or five hours putting programs into the computer and not having

them work." After all, not everyone can learn how to ride a bicycle without falling at least once.

Sincerely,
Hay Doan
Warren, Ohio

Thank you for your very kind words. I think that most editors would agree with me if I said that putting out a computer magazine must be one of the most difficult publishing jobs in the world. You have to assemble text, technical jargon, complex charts, and different types of program listings into some type of coherent form. (It is standard practice in the publishing world to notice typos and other mistakes only after you've printed 100,000 copies.) What's doubly annoying in producing a computer magazine is the fact that if there is but one error in a program listing, it can render the entire program useless. Occasionally the problem resides in

the way the article is pasted up, or (rarely) a printing error can truncate a few characters from a listing, with the afore-mentioned results. All of the program listings in A.N.A.L.O.G. are listed directly from working copies of the program, using Charles Bachand's screen dumper. (See this issue's editorial.) This helps us keep program listing errors to a minimum.

—J.B.

Dear Sirs:

Here are some reprints of a couple of articles I wrote back in December of 1982 for our local ATARI Users' Group Newsletter, (FR)ANTIC. Incidentally, we sent several copies to individuals at ATARI, Inc., like Mark Cator, and Clarice Weisbach, just as we do every month.

I thought you might find it interesting that many of the same points your Mr. Brian Moriarty made in A.N.A.L.O.G. Computing, Issue #11, were also noted in my articles. Feel free to reprint these articles, in whole or in part, in your next issue.

I have also learned that ATARI now offers backup copies for sale to end users (presumably with proof of purchase) for \$30.00 extra! I consider this to be a very weak attempt at supporting the user. Programs like BRODER-BUND's BANK STREET WRITER come with two copies on two separate diskettes, and they were provided at a total cost to the user, less, indeed much less, than the other similar performance products!

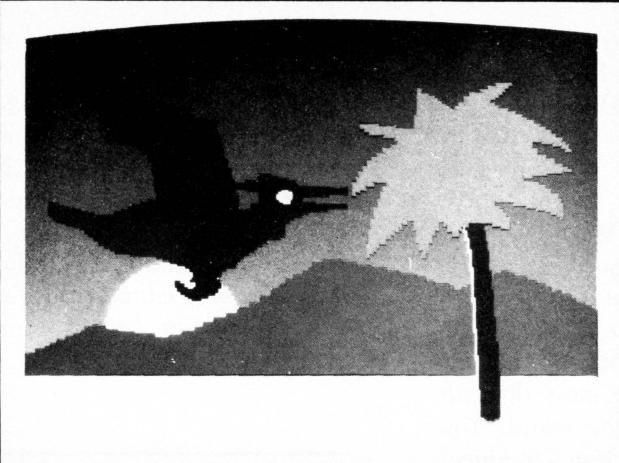
In closing, I would like to applaud your publication for having at least covered the topic of BACK-UP VS. PIRACY. I also noticed that your article never even mentioned HAPPY COMPUTING...I wonder why?

Sincerely,
P.R. Serafine, O.D.
President,
Alamo Area ATARI
User's Association

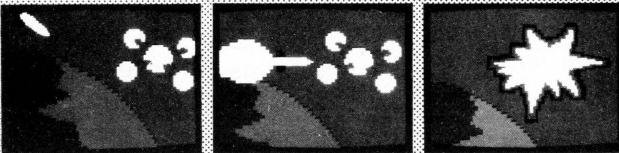
Attention Programmers!

A.N.A.L.O.G. Computing is interested in programs, articles, and software review submissions dealing with the ATARI 400 and 800 home computers. If you feel that you can write as well as you can program, then submit those articles and reviews that have been floating around in your head, awaiting publication. This is your opportunity to share your knowledge with the growing family of ATARI computer owners. A.N.A.L.O.G. pays between \$30.00-\$360.00 for all articles. All submissions for publication must be typed, upper and lower case with double spacing. Program listings should be provided in printed form, and on cassette or disk. By submitting articles to A.N.A.L.O.G. Computing, authors acknowledge that such materials, upon acceptance for publication, become the exclusive property of A.N.A.L.O.G. If not accepted for publication, the articles and/or programs will remain the property of the author. If submissions are to be returned, please supply a self-addressed, stamped envelope. All submissions of any kind must be accompanied by the author's full address and telephone number. Send programs to: Editor, A.N.A.L.O.G. Computing, P.O. Box 23, Worcester, MA 01603.

TAKE COMMAND OF PLAYER-MISSILE GRAPHICS



PM animator



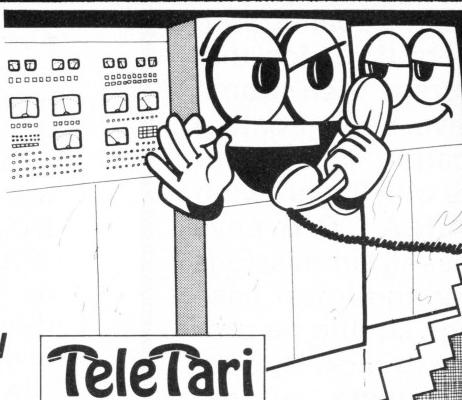
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The articles Mr. Serafine enclosed with his letter make fascinating reading. A substantial excerpt from one of them is reprinted below.

Look for my profile of the notorious "Happy Drive" elsewhere in this issue.

—B.M.

I have it from a spokesperson at ATARI CORPORATE that it is quite legal to "back up" or duplicate ANY existing program from ATARI or anyone else, PROVIDED that it is for your personal use. So if this is true, then why do software producers copyguard their products? The answer is obvious...to prevent UNAUTHORIZED duplication. The only trouble is, that it also prevents the purchaser's "authorized" duplication for personal use.

I feel that the software companies in general have missed the mark in trying to prevent Piracy. The policies of obtaining a back-up copy of software from a producer leave quite a lot to be desired. I am not opposed to copyguarding. My favorite game is PREPPIE!, which is one of the most heavily copyguarded programs available anywhere. What I am opposed to is the attitude of the companies that produce software that the purchaser only be given a new copy of the software, if the original is ruined, or defective, and usually only when the original is returned (presumably as proof of purchase) and only when the purchaser PAYS a fee ranging from \$3.00 to nearly the full price of the software! This is ridiculous!

An example of a very reasonable policy is that of Adventure International. You can obtain a back-up copy of the game PREPPIE! by sending in a proof-of-purchase coupon and the cost of the diskette. You get two fresh copies of the program for the purchase price plus this media price. You don't lose your original in the bargain.

An example of a ridiculous policy is ATARI, Inc. You can purchase for \$150.00, The Bookkeeper, which comes on four SLOW FORMAT and heavily protected diskettes. What's more, these diskettes do not even have reinforced hub rings! All this on a program which must, by its very nature, constantly access the diskettes. Surely it doesn't take a genius to figure out that the diskettes WILL eventually wear out. Well let's see, we can back up our Bookkeeper, right? Well, unless the user has a special version of ATARI DOS, he/she cannot, since the disks have "bad sectors" which cause DOS to hang up. Well, maybe we can send in a coupon...oh, they don't give one with it. Well maybe they state their replacement policy on the package or in the documentation...oh, they don't.

This sort of attitude is what promotes Piracy. The companies which do not provide a fair means of obtaining a back-up copy of their software are in the majority. They spend thousands of dollars on programming and equipment to copyguard their products, and of course they pass this along to the purchaser. This higher priced software is justifiable if the company will provide a back-up copy for a reasonable price with proof of purchase. It is not justifiable if the company provides the software on inferior media and has NO stated back-up policy other than for the user to purchase a second copy at full price! Synapse Software is now providing a back-up copy of FILEMANAGER 800+ on the flip side of the original. This is a middle ground policy, but what happens if the disk is physically damaged? You zap BOTH copies at once! This is not as ideal a policy as that of Adventure International.

What is the solution for the end user? By boycotting the companies whose policies are unreasonable, your power can be felt! By writing to these com-

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panies and complaining your voice can be heard. It is also a good idea to write letters of praise to the companies whose policies you feel are fair, for positive reinforcement. I believe in getting quality software on quality media when I pay a premium price for it, and I think it is my right as a purchaser to have a back up copy for insurance against needless down time when my original is lost or damaged. If we were getting our programs on an indestructible medium, I could understand the company's not providing a back-up, but diskettes and cassettes are perishable! □

Dear Editor:

Thank you for including ABC in your review of BASIC compilers for ATARI computers. We at Monarch Data Systems feel the review was honest and fair in showing both positive and negative aspects of all the products.

There was, however, one mistake in the review regarding the line number that caused ABC to generate an error. The review reported that the error occurred on line 66 of the adventure program. It was really line 68 that caused the problem. Line 66 has only three GOSUBs but line 68 has 25! Due to an incorrect constant in the compiler, the current version of ABC only supports at most 20 GOSUBs in a statement. This minor problem will of course be fixed in future releases.

We would also like to clarify two points that have caused some confusion to our customers.

- ABC does allow variable expressions in DIM, GOSUB, GOTO, and RESTORE statements.
- ABC automatically shows both the error code and BASIC line number when errors occur at run-time.

Thanks for letting us clarify these points and keep up the great work on the magazine.

Sincerely,
E. Goldberg
Director of Marketing
Monarch Data Systems

Sorry about the typo. Incidentally, if you want to compile Adventure in the 5th Dimension with Monarch's ABC (version 1.02 or earlier), simply replace the following lines:

```
66 GOSUB 16:GOSUB 28:M$ (Q,
Q+C15)=CLS:ST$ (C5,C5)=CHR$ (Z):GOSUB 28:CLS=M$ (Q,Q+C1
5):? OK$:POSITION C2,C0
67 ? #C2;"YOUR location:";
:POSITION C2,C1:Z=Z-64:IF
Z>19 THEN ON Z-19 GOSUB 45
,46,46,46,47,48:GOTO 69
68 ON Z GOSUB 30,31,31,32,
31,31,31,33,34,35,36,37,38
,39,40,41,42,43,44
```

—B.M.

Dear A.N.A.L.O.G.:

I have a question concerning your recent article on disk copy programs. My friend, who owns an Apple II, tells me about games he has copied from his friend using **Nibbles Away 2**. It would be a waste of time to go on about my honest intentions in using such a program, but I can just say that they would be honest. Anyway, it said in the article that "if you want to make dupes of Choplifter," etc., etc., "forget it!" Well, honestly or not, this is what my friend is doing, and I am wondering if there is anything like this for the ATARI. Your article said that there was not, but why? It also talked much about the mechanical workings of the 810. Do the Apple and the ATARI drives differ so much that the Apple is able to produce a copy of an Apple game, but the ATARI is not able to make a copy of an ATARI game?

I hope you can clarify this for me.

Sincerely,
Chris Bull
Carlisle, MA

Apple disk drives are "dumb." This is not intended as a slur; rather, it indicates the Apple drive's lack of built-in controller circuitry. The Apple's disk access functions are

directed by an external controller board that plugs into the computer. This arrangement makes it possible to read or write an Apple disk almost any way you want — unlike the semi-intelligent ATARI drive, which allows only one type of read and two types of writes. The result is that it is much harder to copy-protect an Apple disk than it is to protect an ATARI disk. This fact has not been lost on programmers like Dan Gorlin (the author of **Choplifter**), who deserves a fair profit from the sales of his game and would probably be very interested to know why your "friend" is making unauthorized backups.

—B.M.

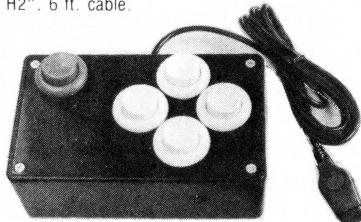
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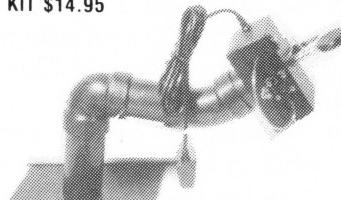
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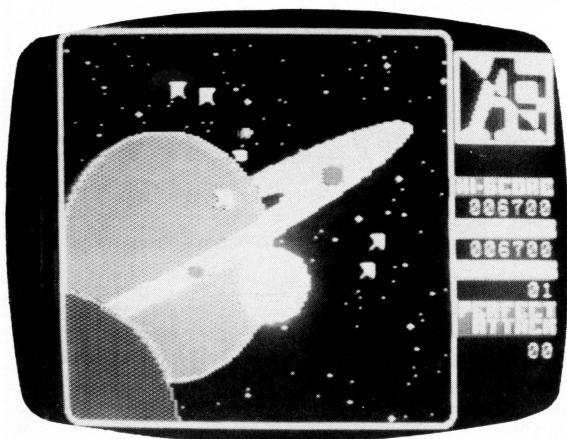
NEW PRODUCTS

by The Program Doctors

There are many new, exciting developments from the world of ATARI. ATARI is now seeking outside help from such companies as Datasoft and Roklan in software development. They have bought the rights to such quality programs as Reston's PAINT and Visicorp's VISICALC to be re-released under the ATARI brand name. In the very near future you will see DONKEY KONG, MS. PAC-MAN, SUPERMAN III, and a new cartridge version of EASTERN FRONT. The most important news from ATARI is the fact that several new computers with associated peripherals will be unveiled at the Summer Consumer Electronics Show. (See A.N.A.L.O.G.'s profile of these products elsewhere in this issue.)

On the third-party software front there have been several great new pieces of software released, especially in the arcade classification. Broderbund has done an excellent job putting both CHOP-LIFTER and SERPENTINE on ROM. A.E., a 48K disk with 3-dimensional graphics is the best of their new games. Beginning on Earth, you must chase the swooping A.E., which fly in varied formations off the Earth's surface to the outer reaches of the Milky Way. Unlike other 3-D games, A.E. actually uses its graphics to enhance playability. Game play is fast and the five screens accurately recreate actual solar system conceptions.

The long-awaited Sky Blazer is finally out. If this game had been released on schedule (almost a year ago) it might have been something special. But with the constantly improving quality of game software, this game does not break any new ground.



A.E.

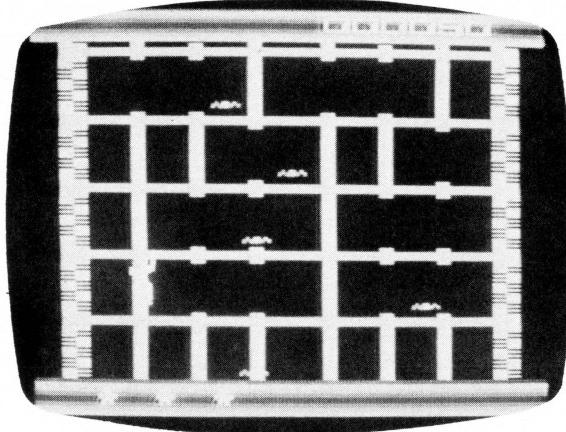


To say that Broderbund's BANK STREET WRITER is an excellent word processor would be a very misleading statement, unless we qualify it by saying HOME word processor. While LETTER PERFECT is still the reigning Cadillac of word processors for the ATARI, it is expensive, requires a certain amount of "study time" to be able to use all the features effectively, and contains some things that are best suited for a small business. While BANK STREET WRITER has many limitations (no underlining, no right justify, no boldfacing, no mail list merge), its simplicity is its best feature. Most of the standard editing features are included, and on the back side of the disk is a tutorial that will take you step by step through the major menu options, with more in-depth instruction supplied in the well-written reference manual. Broderbund set out to write a word processor geared to students' term papers or that overdue letter to your Uncle Ron in Philadelphia, and in this they have succeeded admirably.

When the first Sirius games were released they were criticized for their under-utilization of ATARI's sounds and graphics. SNEAKERS, SPACE EGGS and SNAKE BYTE were Apple clones. With BANDITS and WAYOUT they turned the corner, since both were great games. Now with REPTON and the Hi-Res adventure BLADE OF BLACKPOOLE they can be considered among the elite of the third party creators. It takes a lot of guts to place the words "KILLER GAME" under the title REPTON but they are not kidding. This "save your planet from absolute destruction" game is unlike any of the previous "SYMPFAD" games because in order for you to win you must have your planet destroyed. Sirius may have confused some people with their disk-based instructions but there are TWO separate screen displays, the second of which you can't get to unless you lose during the first part of the game, but survive! If this sounds confusing check this game out; it contains some of the most complete uses of ATARI sound and graphics to date and is a must for any DEFENDER freak.

Experienced adventurers will enjoy BLADE OF BLACKPOOLE, with its fast graphic drawings and point system style of play to allow replayability. Its medieval theme and fantasy logic take you on a picturesque journey in search of a mighty sword,

supposedly hidden in the Lake of Blackpoole. Sirius has yet another winner with this adventure and their soon-to-be-released CRITICAL MASS will surely place them right up there with Scott Adams, Infocom and Sierra On-Line as adventure leaders. But we feel that a word to the marketing people at Sirius is now called for. ATARI computer owners are a sophisticated lot. The amount of quality software you are producing is great and you should be congratulated. But please stop releasing your VCS conversions! WORM WAR II, FAST EDDIE, TURMOIL, and SQUISH 'EM are poor excuses for computer arcade games. Although all of these ROM-based games are conceptually good they lack the fine programming techniques with which Sirius is becoming synonymous. If the same attention that was paid to SQUISH 'EM for the Commodore 64 was given to the ATARI version, then this game could have been a hit, but we cannot recommend it.



Squish 'em

Sierra On-Line seems to be going in the opposite direction of Sirius. The company that gave us FROGGER, THRESHOLD, the original JAWBREAKER and the Hi-Res adventures, while still holding their high standing in the Apple market, is rapidly losing the respect they have earned from ATARI owners by releasing such programs as MAURADER, WALL WAR, LUNARLEEPER and the re-written JAWBREAKER.

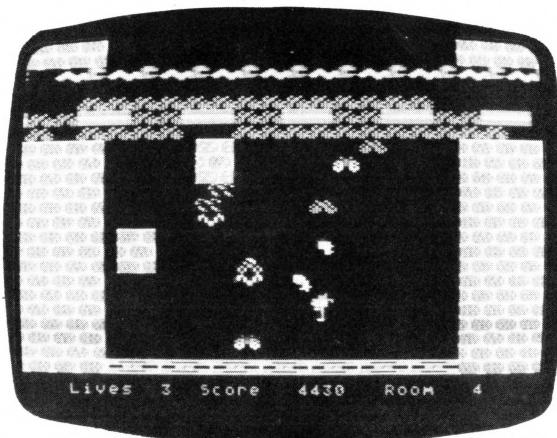
MAURADER is a cheap combination of MISSILE COMMAND and SHAMUS, with poor graphics, sounds and playability. LUNARLEEPER, while a somewhat better game, is also sadly lacking in the graphics and sound areas. WALL WAR is a graphic symphony, and upon first boot-up, we began to think that maybe On-Line had come to their senses. Then we played it, and realized that the game is totally pointless. On-Line's decision to release their new version of JAWBREAKER is really hard to fathom. The third and latest version is an imitation of the Tigervision version written for the VCS. Unless this is a result of the widely publicized lawsuit

between On-Line and ATARI over PAC-MAN, we can see absolutely no reason to take what was at one time the most popular game for the ATARI computer, and turning it into a class-B piece of software.



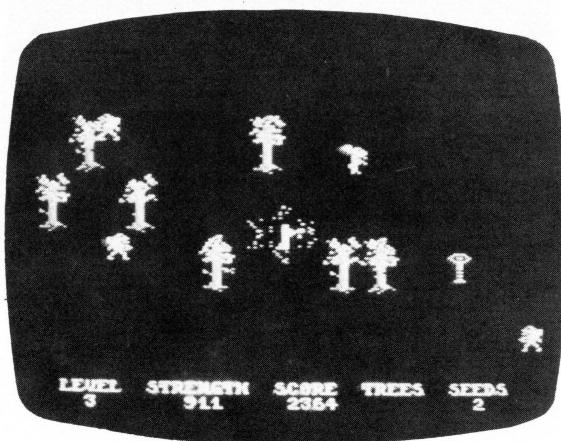
Fort Apocalypse

The recent release of five new games (FORT APOCALYPSE, SHAMUS:CASE II, SURVIVOR, NECROMANCER and THE PHARAOH'S CURSE) places Synapse at the top of the heap in third party software for the ATARI. SHAMUS: CASE II is a sequel to the original software smash. The Shadow is back with a new underwater fortress and new sidekicks to deter you as you attempt to find his throne room and rid the waters of his dastardly deeds. The lack of a pause key in the original was a major problem since, unless you had 3 arms and 4 eyes, there was no easy way to map the floors of the Shadow's Lair. In CASE II you not only have a pause key but whenever you do take a break you can view the entire progress of your mission. (The program draws the map for you and it saves that map from game to game.) Gamers please note: CASE II is totally different from CASE I, and this 32K T/D game is great.



Shamus II

The strangest of the new Synapse titles is NECROMANCER; this game is impossible to describe in the space allowed. It consists of three totally different sections, all interrelated; the second and third contain five levels each. Game play is fast and furious, and there is nothing that can be compared to NECROMANCER on the market at this time.



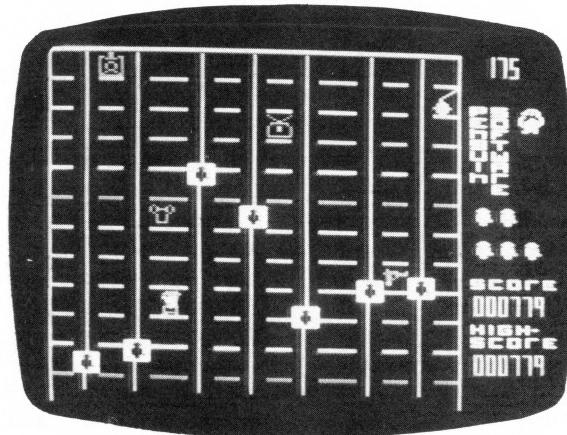
Necromancer

There have not been many games that four people could play at the same time, but SURVIVOR allows up to four interactive players working together to eliminate the armed forts of the Xenogryphs. Some very nice spaceship movement and shooting effects are included. THE PHARAOH'S CURSE, a multi-level arcade-adventure in the style of SHAMUS, and FORT APOCALYPSE, a combination of CHOPLIFTER and CAVERNS OF MARS round out the list of Synapse's latest products.

Odesta has released three new programs. CHESS, CHECKERS, and ODIN are just about as good as you can get. Beginning with the first-rate packaging job and going all the way to the well-written documentation, these programs are top-shelf. The programs were written by people who are authorities in their fields. Peter Frey is one of the U.S. Othello Association's top-rated players and a professor at Northwestern University, teaching psychology and computer science. Larry Atkin and David Slate are winners of the World Computer Chess Tournament, and 8 North American Computer Championships. These credentials alone should convince you that the game logic is superb, and all of the extra features just add to the overall polish. There are too many of them to list them all, but they range from different levels, opening move libraries, advice and prediction of best moves, graphic illustrations of attacks and defenses, and our favorite, the MOVIE, in which you can play a game, and then have the computer play it back for you. These games are highly recommended for people in all skill categories; they will help the beginners and challenge the masters. We don't know what will

come next in the MIND OF MAN series, but if Odesta is open to suggestions, we sure could use some quality software for bridge, hearts, gin rummy, Scrabble...

SPY'S DEMISE is the winner of this issue's "Potato Chip" award. You can't stop playing it. Penguin Software's first ATARI release is an original arcade-type game that combines good graphics, catchy tunes and a puzzle in what is basically a very simple concept. The first line of the documentation describes it like this: "Generally there are two instructions. Left. Right." The idea is that you are a spy trying to locate and decipher the parts of a secret code that have been stored on separate floors of a diplomatic mission. The playfield is a grid work of the floors of the building, and you must make your way across each floor, and up to the next one, until you reach the top. There are seven embassy guards riding up and down in elevators and you must avoid them as you make your way across the floors. If you can make it to the top of the screen, you are rewarded with one line of a cryptic message. Each successive screen has one less floor, making it harder and harder to accurately time your walk across. Gather all the information, crack the code and Penguin Software will award you with an official SPY'S DEMISE T-Shirt (according to Penguin, T-Shirts will be awarded to the first solver from each state, each Canadian province, and each other country, but we feel that anybody who can solve this is deserving of recognition!) We welcome Penguin Software to the ever-growing list of third party producers and ask if SPY'S DEMISE is here now, can PIE-MAN and TRANSYLVANIA be far behind?



Spy's Demise

The long awaited STARBOWL FOOTBALL is finally available. Gamestar redid the game when it realized that 16K would not be enough memory to make a realistic football game. Styled after Mattel's Intellivision classic, at 24K STARBOWL FOOTBALL is by far the best sports game for the ATARI at this time. Its one or two player option is a definite

Experience the MicroProse Challenge !!!



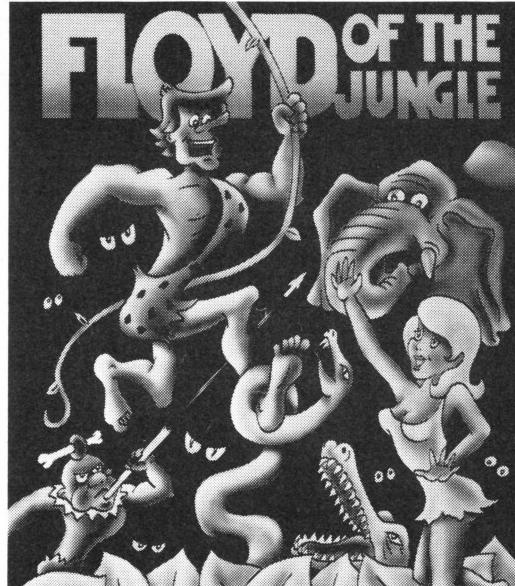
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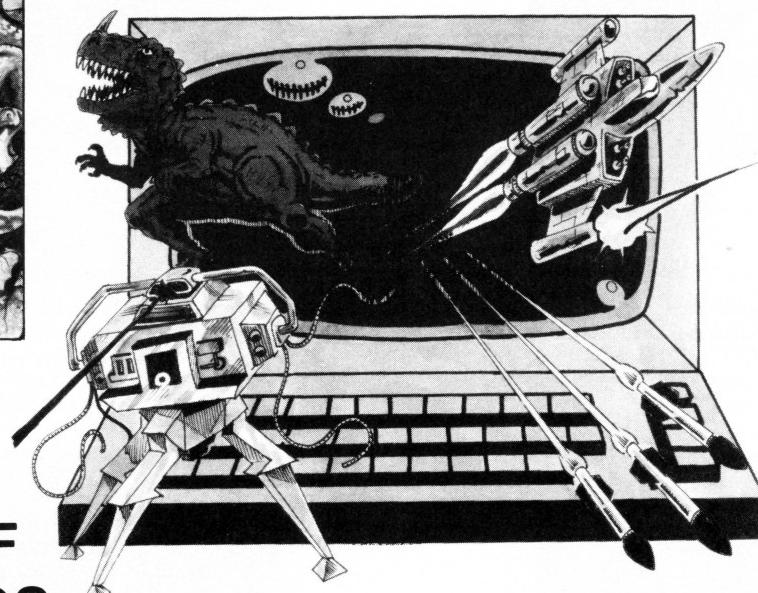
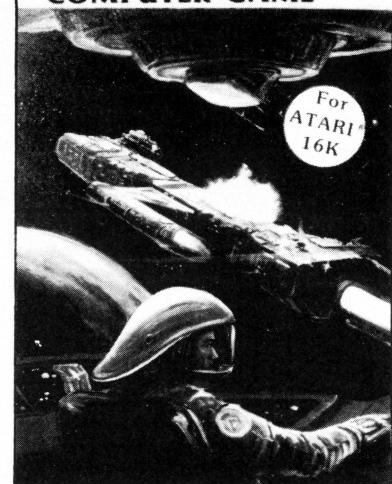


Your only chance for survival is to trudge 340 kilometers to an abandoned research station when your starship is downed on an alien world. But your food supply and weapons are limited to what you can carry, and the planet's carnivores are huge and hungry. SURVIVAL features full-color terrain and computer-generated encounters. Great for solitaire or multi-player gaming!

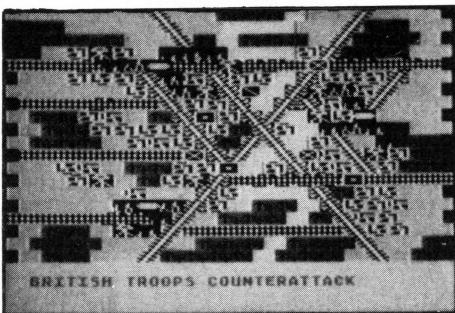
Experience the thrill and excitement of ship-to-ship combat in deep space. In this game for two players, each player creates a fleet, and then enters his moves and the weapons he wishes to fire. The computer resolves all movement and combat, records the damage, and then scores the victory points. Design your own scenarios, or use the preset ones—either way, STARFIRE is a classic!

STARFIRE COMPUTER GAME

For
ATARI®
16K



THE WAR OF THE WORLDS



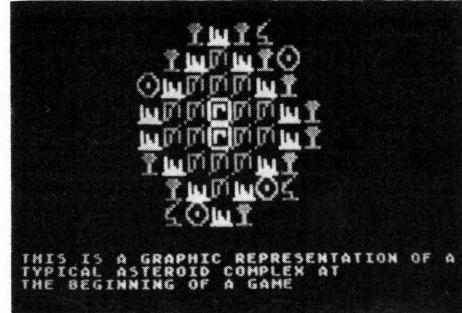
BRITISH TROOPS COUNTERATTACK

Relive H. G. Wells' classic tale of the battle that ensued when the Martians invaded Earth and the humans desperately struggled to save Mankind. The computer-controlled Martians land their pods and launch their attack by burning anything and everything in their path. The player controls the humans, and must figure out how to stop the Martians before all of London is burning.

Your space fighter bomber swoops over the surface of the asteroid through the red glare of the laser towers' deadly fire. You are trying to incapacitate the asteroid's mining operations. But is your own asteroid safe? In this game for one or two players, you attack your opponent's asteroid with your heavily-armed bombers, and must score repeated hits to destroy it.

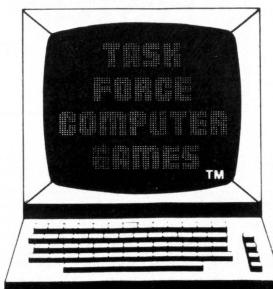
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THIS IS A GRAPHIC REPRESENTATION OF A TYPICAL ASTEROID COMPLEX AT THE BEGINNING OF A GAME

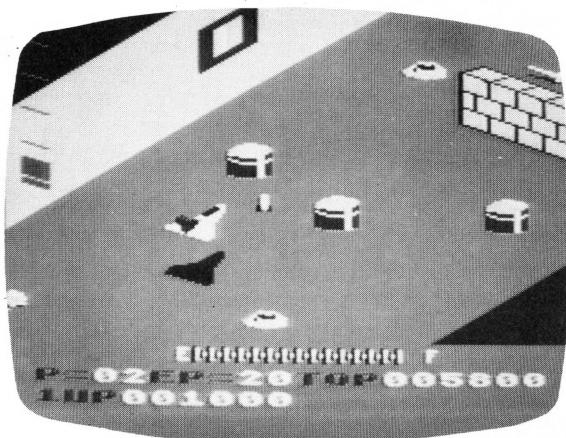
New Strategy Games for Atari 16K Cassette from
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plus (it's hard enough getting our mates into space games without forcing a football game down their throat).

The most difficult aspect of STARBOWL is the offensive pass catching. Here's a hint: watch the defensive man who is guarding your designated receiver; as soon as the defensive man cuts to cover his programmed area throw the ball. This will increase your completion percentage. Speaking of sports games, another delayed release is Inhome Software's BASEBALL. This TWO player cartridge lacks playability, and at \$50 retail your money could be better spent on a number of different items.

Datasoft's official Sega version of ZAXXON is here. Sadly, the 16K tape does not recreate the glamour of playing the arcade classic. On disk the program is definitely improved but unfortunately it still doesn't make you feel as if you've inserted a quarter in the slot. Don't worry, some enterprising programmer will take the ZAXXON concept and design a better game. Datasoft has not only antagonized the buyer by their widely advertised "available now" (in actuality the disk version was not out until May), but they did not even recreate the arcade feel of the game.



Zaxxon

The latest release from EPYX, a company well-known for its BASIC adventures, is called JUMPMAN. When we first heard of the pending release of this game we were, quite frankly, very skeptical. Upon seeing the game we were astounded. JUMPMAN is by far the best piece of software from EPYX. A 30-screen machine language arcade game with many difficult options, JUMPMAN includes music, great arcade sounds and graphics, and many different scenarios. Your mission is to rid Jupiter headquarters of bombs planted in every room. The building is heavily protected by robots, dragons, birds and unseen sharpshooters. Your JUMPMAN must climb ladders and ropes, deal with vanishing mazes and solve puzzles as he attempts to save the building.

Speaking of climbing games, another excellent one is CRISIS MOUNTAIN from Synergistic Software. This strategic action game combines two separate cavern scenes with increasingly difficult levels of play. You must disarm a cave that has been booby-trapped by terrorists and pick up their supplies and loot before the bombs explode and destroy the West Coast. CRISIS MOUNTAIN is quite addicting and random placement of the bombs and bonus objects make this dual screen game different every time you play.

Spinnaker has added to their rapidly growing line of educational products with KINDERCOMP (Ages 3-8), STORY MACHINE (Ages 5-9) and FACE-MAKER (Ages 4-12). These 48K disks integrate learning with computer familiarity in a way that is fun and exciting. KINDERCOMP is five games in one: completing number sequences, matching series of shapes, drawing colorful pictures on the screen and having the computer act out a kaleidoscope of your child's name all help to develop creativity and improve counting skills and reading readiness. STORY MACHINE helps children learn to write sentences using words from a supplied listing, and then the computer acts it out. FACEMAKER, a computerized form of Mr. Potato Head with animation, is Brett's favorite (our two-year-old son — Theo's the computer, Brett's the kid!).

Financial Software Plus, Kalamazoo, MI., and Habcom Business Systems, Inc., Lindenhurst, IL., are helping to fill the void in the "Where is all the business software for the ATARI?" department. Financial Software Plus has a new PAYROLL PACKAGE that's user friendly and will work as a stand-alone program or as an integral part of their general ledger program. It was written by an accountant-programmer and is very flexible. The tax codes are user-changeable, with the ability to put in five different tax tables. It will run on a one- or two-drive system, and all reports including checks can be printed to either the screen or an optional printer. With a capacity of 100 employees per disk (and an unlimited number of disks), it can be used by almost any size company effectively.

Professional systems from professionals is also what Habcom Business Systems is all about. They are marketing a complete hardware and software package for funeral homes, and software written by a licensed funeral director. This program will handle all billing information efficiently and enables you to print itemized statements, payment reminders, collection letters and aging reports, with Pre-arrangement File and Inventory Control as optional features.

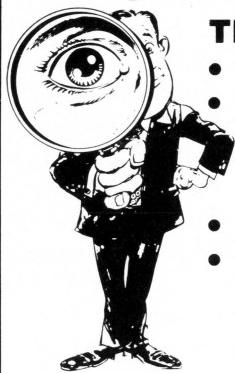
Computari has published the first issue of Financial Wizard Newsbits, sent to all Financial Wizard owners. It will be sent periodically to keep you informed of updates to FW, the first of which

should be available soon. UTILITIES #2 will contain three additional ways to make your FW an even more powerful and useful tool. LEDGER will provide a general ledger printout by month; REGISTER will give you a complete check register with a balance shown next to every entry; FORECAST will give you statistical analyses and graphical representations of your future expenditures.

A-Bit-Better-Software (ABBS) has found a bug in the sort routine of their MAGIC MAIL program. If you own this program and are having trouble sorting, send your disk to ABBS at P.O. Box 28, Laurel, MD 20707, and they will send you a fixed version.

That about wraps it up for this issue. If by some bizarre chance you have not found at least one new program that appeals to you, come back next issue when we will report on the Summer Consumer Electronics Show and the First Annual Software Showcase. □

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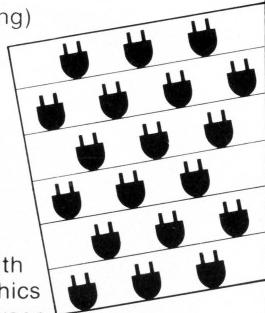


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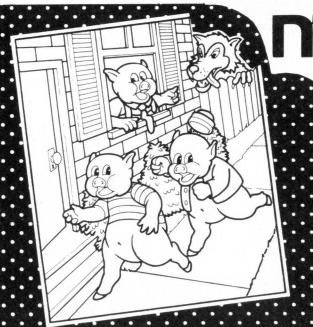
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24K disk

by Tom Hudson

There are several graphics artwork programs available for ATARI personal computers. One of the more popular packages, Datasoft's MICRO-PAINTER, allows the generation of pictures in GRAPHICS 7+, a mode that is not available with the current operating system.

Many people would like to use pictures generated with MICRO-PAINTER in their BASIC programs, but don't know how to load them. This article will present a fast, machine-language subroutine which sets up the proper graphics mode and loads standard MICRO-PAINTER files.

Micro-Painter Files

MICRO-PAINTER allows computer artists to easily draw and save high-resolution graphics displays. When a graphic display is saved, the entire graphics memory area is saved, along with four color indicator bytes. The picture area consists of 192 lines, each containing 40 bytes, for a total of 7680 bytes. This plus the 4 bytes of color information comes to a total of 7684 bytes in a MICRO-PAINTER picture file.

"Oh," you say, "all I have to do is put these bytes where they belong in memory, and that's it?" Not quite.

As mentioned earlier, MICRO-PAINTER uses GRAPHICS 7+, a mode similar to GRAPHICS 7, but with twice the vertical resolution. In order to get the proper display, we must tell the computer to display the picture in mode 7+. Listing 1 is a BASIC program which sets up the graphics mode, reads the picture file, and sets the proper colors. Listing 2 is the assembly language source code for the picture loader subroutine, for those readers interested in machine-language programming.

Picture Perfect

Type in the program in listing 1. After it is SAVED, RUN it. The program will ask for a MICRO-PAINTER filename. Place a disk with a MICRO-PAINTER picture file on it in your disk drive and type in the filename, with the "D:" prefix. If you make a mistake, the program will ask again.

Once you enter a valid filename, the program will load the file very quickly, placing it on the screen.

While the picture is being loaded, you may notice that the colors in the picture are not correct. This is because the four color bytes are at the end of the file, and are read last. As soon as the picture is completely loaded, the colors will be changed to their proper values.

The Program

Let's look at Listing 1 and walk through the program.

Line 230 — This line sets up the string LD\$ and READS the DATA in lines 390-430 into this string. This is a machine-language subroutine which sets up the GRAPHICS 7+ screen and reads the 7680 bytes of picture information into the screen RAM very quickly.

Line 290 — Sets up a string variable to hold the picture filename.

Line 300 — Inputs the picture filename and opens the file as input. The "TRAP 300" will cause any errors to be sent to line 300. That is, if there is any error condition, the program will ask for the filename again.

Line 310 — This line actually sets up the GRAPHICS 7+ mode and loads in the picture. The "GRAPHICS 24" command sets up a full-screen GRAPHICS 8 screen, which happens to use 7680 bytes, the same as GRAPHICS 7+. The USR call "A=USR(ADR(LD\$))" converts the GRAPHICS 8 screen to GRAPHICS 7+, then reads the first 7680 bytes of the picture file into the display memory. During this operation, you will see the picture appear from the top of the screen to the bottom.

Line 320 — The USR call returns a value in the variable "A." If this value is a 1, the picture data was loaded successfully and the program continues with the next line. If the value is not 1, there was some type of error and the program goes to line 300 and asks for the filename again.

Line 330 — This line reads the last four bytes of the file, which contain the picture's color information. These values are POKEd into the color registers. At this point, the picture is completely loaded, with correct colors.

Line 340 — This line loops until the START key is pressed.

Line 350 — Once the START key is pressed, this line transfers control to line 300, which asks for another filename.

Lines 390-430 — These DATA statements are the machine-language values for the picture loader.

Using The Loader In Your Programs

The machine-language picture loader presented here is very easy to use in your own programs. Simply follow the step-by-step instructions.

- Set up LD\$ with the machine-language sub-

routine. (Line 230)

- Open IOCB #1 as input with the desired filename. You MUST use IOCB #1 or the loader will not work.
- Do a GRAPHICS 24 command.
- Call the machine-language subroutine with the command: A=USR(ADR(LD\$))

That's all there is to it!

Summary

With this subroutine, ATARI computer owners who use Datasoft's MICRO-PAINTER graphics package will be able to show their pictures in their BASIC programs. The subroutine is much faster than BASIC, and is easy to use. □

```

100 REM *****
110 REM *
120 REM *      MICRO-PAINTER*
130 REM *      PICTURE LOADER
140 REM *
150 REM *      BY: TOM HUDSON
160 REM *
170 REM *      * TM OF DATASOFT, INC.
180 REM *
190 REM *****
200 REM
210 REM *** READ LOADER DATA ***
220 REM
230 DIM LD$(117):FOR X=1 TO 117:READ N
:LD$(X)=CHR$(N):NEXT X
240 REM
250 REM *** INPUT FILENAME AND ***
260 REM *** LOAD PICTURE FROM ***
270 REM *** DISK ***
280 REM
290 DIM FILE$(15)
300 GRAPHICS 0:PRINT "ENTER MICROPAIN
TER FILENAME":INPUT FILE$:TRAP 300:CLOS
E #1:OPEN #1,4,0,FILE$
310 GRAPHICS 24:A=USR(ADR(LD$))
320 IF A<>1 THEN 300
330 GET #1,C1:GET #1,C2:GET #1,C3:GET
#1,C4:CLOSE #1:POKE 712,C1:POKE 708,C2
:POKE 709,C3:POKE 710,C4
340 IF PEEK(53279)<>6 THEN 340
350 GOTO 300
360 REM
370 REM *** PICTURE LOAD DATA ***
380 REM
390 DATA 216,104,173,48,2,24,105,3,133
,203,173,49,2,105,0,133,204,160,0,177,
203,201,79,200,21
400 DATA 169,78,145,203,165,203,24,105
,2,133,203,165,204,105,0,133,204,169,0
,240,14,201,15,208,6
410 DATA 169,14,145,203,208,4,201,65,2
40,17,165,203,24,105,1,133,203,165,204
,105,0,133,204,169,0
420 DATA 240,198,162,16,169,7,157,66,3
,169,0,157,72,3,169,30,157,73,3,165,88
,157,68,3,165
430 DATA 89,157,69,3,32,86,228,189,67
,3,133,212,169,0,133,213,96

```



CHECKSUM DATA (See p.46)

```

100 DATA 778,241,397,385,250,348,256,5
80,262,805,76,837,82,434,88,5819
250 DATA 612,463,491,100,48,757,202,42
6,803,834,706,96,200,102,572,6412
400 DATA 843,818,225,976,2862

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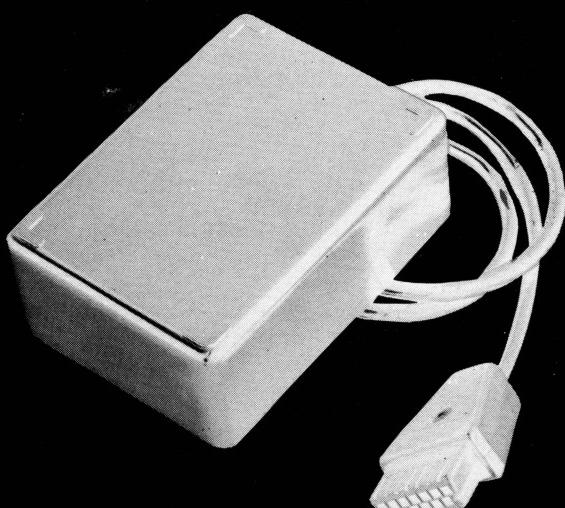
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- The ability to speak with inflection and feeling.
- Can speak in a foreign language with correct foreign spelling as input.
- A talk and spell program by Ron Kramer. Users can program any vocabulary for this spelling game. In fact, this program can even speak in a foreign language like French, where the user must spell the correct word in English, or vice versa.
- GREEN GOBLINS—A talking arcade game by John Wilson.
- Random Sentence Generator—An amusing grammar game that helps teach school children to identify parts of speech and recognize a variety of sentence structures.
- NUMBER SPEAK—A subroutine by Scott Matthews that converts up to a 9 digit number into normal English pronunciation. Ideal for building your own math games.
- STUD POKER—A talking poker game by Jerry White.
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MICROPAINTER (TM) LOADER

WRITTEN BY: TOM HUDSON
A.N.A.L.O.G. COMPUTING

OPERATING SYSTEM EQUATES

DLISTL	= \$0230	DISPLAY LIST LO
DLISTH	= \$0231	DISPLAY LIST HI
IOCBI	= \$10	CONTROL BLOCK OFFSET
GETCHR	= \$07	GET CHARACTERS CMD
SAVMSC	= \$0058	SCREEN POINTER
CIOV	= \$E456	CENTRAL I/O VECTOR
ICCOM	= \$0342	I/O COMMAND
ICSTA	= \$0343	I/O STATUS
ICBAL	= \$0344	I/O BUFFER LO
ICBAH	= \$0345	I/O BUFFER HI
ICBLL	= \$0348	BUFFER LENGTH (LO)
ICBLH	= \$0349	BUFFER LENGTH (HI)
BASVAL	= \$04	BASIC RETURN VALUE

MY WORKING VARIABLES

LO	= \$CB
HI	= \$CC

RELOCATABLE ROUTINES

ORG \$6000 ;ANYWHERE

DISPLAY LIST INITIALIZATION

SETUP	CLD	CLEAR DECIMAL MODE
	PLA	(DISCARD)
	LDA DLISTL	FIND THE
	CLC	ADDRESS OF
	ADC #3	THE BASIC
	STA LO	DISPLAY LIST
	LDA DLISTH	AND PLACE
	ADC #0	IN A PAGE 8
	STA HI	WORKING AREA
	LDY #0	NO Y OFFSET
SCANDL	LDA (LO),Y	SCAN THE DISPLAY LIST:
	CMP #\$4F	CHANGE
	BNE NOMLD	\$4F (GR. 8)
	LDA #\$4E	TO
	STA (LO),Y	\$4E (GR. 7+)
	LDA LO	SINCE THIS WAS
	CLC	A 'LOAD MEMORY'
	ADC #2	INSTRUCTION (3 BYTES)
	STA LO	WE WILL SKIP
	LDA HI	THE NEXT 2 BYTES
	ADC #0	TO GET THE NEXT
	STA HI	DISPLAY LIST
	LDA #0	INSTRUCTION
	BEQ NXTDLB	ADDRESS.
NOMLD	CMP #\$0F	CHANGE \$0F (GR. 8)
	BNE NOREGL	TO
	LDA #\$0E	\$0E (GR. 7+)
	STA (LO),Y	AND GO TO
	BNE NXTDLB	NEXT D.L. INSTRUCTION.
	CMP #\$41	END OF DISP. LIST?
	BEQ LOAD	YES, LOAD DATA
NXTDLB	LDA LO	INCREMENT THE
	CLC	MEMORY POINTER
	ADC #1	TO GET THE

STA LO ;NEXT BYTE
LDA HI ;OF THE
ADC #0 ;DISPLAY LIST
STA HI ;AND
LDA #0 ;FORCE BRANCH
BEQ SCANDL ;BACK TO LOOP!

SCREEN LOADER CODE

THIS CODE READS 7680 BYTES
FROM IOCBL #1 VERY QUICKLY
AND PLACES THEM IN SCREEN RAM

LOAD LDX #IOCBI ;CONTROL BLOCK
LDA #GETCHR ;COMMAND BYTE
STA ICCOM,X ;SET COMMAND
LDA #7680/255 ;SCREEN SIZE LO
STA ICBLL,X ;SET LENGTH LO
LDA #7680/256 ;SCREEN SIZE HI
STA ICBLH,X ;SET LENGTH HI
LDA SAVMSC ;POINT TO DISP LO
STA ICBAL,X ;SET I/O BUFFER LO
LDA SAVMSC+1 ;POINT TO DISP HI
STA ICBAH,X ;SET I/O BUFFER HI
JSR CIOV ;LOAD THE SCREEN!
LDA ICSTA,X ;GET STATUS BYTE
STA BASVAL ;SAVE FOR RETURN
LDA #0 ;PUT A ZERO...
STA BASVAL+1 ;IN HI BYTE
RTS ;EXIT TO BASIC!

.END

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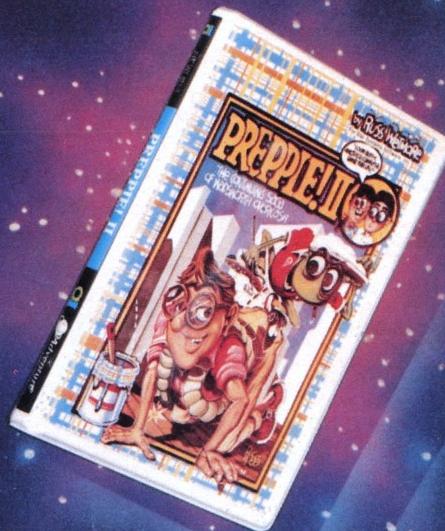
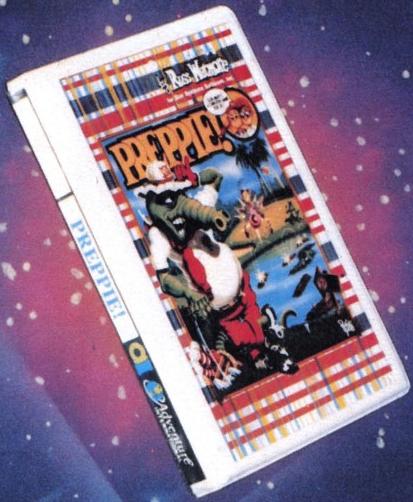
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16K cassette 24K disk

by Andrew Katz

After seeing the expansion of crystals in a TV film, I wanted to see if I could simulate that beautiful event using my ATARI. The graphics demonstration program presented in this article does just that. Type Listing 1 into your computer and check your typing accuracy by using C:CHECK or D:CHECK. If you don't have either CHECK program, be sure you SAVE the expansion demo before running it.

After the program is entered, RUN it. You will see 15 different-colored "seeds" appear. These seeds will gradually begin to grow into larger groups of pixels, all pixels in a group being the same color. The shapes will grow until they collide with a different-colored group, at which time they will stop growing. Those shapes lucky enough to avoid early collisions will become the largest. Eventually the screen will become solid with color, resembling a colorful map. Pressing the START key will start the process again from the beginning.

The BASIC program provided (lines 70-110) can be changed to build other scenarios. Experiment with other graphic modes, make line drawings and watch them grow together, and so on.

There are several parameters which can be changed to give different effects. These parameters are in lines 1000-1040. The 3 in line 1040 controls the rate of expansion. Change it to a 2 and RUN the program. Now the rate of expansion is many times quicker. You will notice holes appearing as the shapes form. These holes fill soon and the shapes stay completely well formed. Change the 3 to 1 and the expansion will look like a boiling pot!

Why GTIA? Well, GTIA modes are the easiest to program, and of course they give the most color. This program will work for those without GTIA, but the colors will be different. I am told that all ATARI computers sold in 1982 and after have the GTIA. I recommend that anyone without a GTIA chip get

one from ATARI. They cost only \$22 and are easy to install (see "Installing Your Own GTIA Chip" in A.N.A.L.O.G. #10).

I have provided the assembly source code listing (Listing 2) for those interested in seeing how the expansion works. In each cycle, a pixel is chosen at random. Note that I have cut the Y resolution in half to get a more even aspect ratio. Once the pixel is chosen, a neighborhood around the pixel is read (see FIGURE 1). The neighborhood is then reordered into a clockwise loop (one for pixels with an even X coordinate, and one for an odd coordinate). If the pixel chosen is uncolored AND there are 3 pixels in a row with the same color surrounding it, the pixel is plotted with that color. Otherwise it is left alone. That's all there is to it. If you have any questions or suggestions, contact me at 9 River St. Ext. 158, Little Ferry, NJ 07643.

Figure 1
One Neighborhood

XPOS	20	21	22	23
0	1	2	3	
4	5	6	7	
8	9	10	11	

**Adjacent Neighborhoods
(Dependent on X position)**

IF XPOS ODD

0	1	2
4	5	6
8	9	10

IF XPOS EVEN

1	2	3
5	6	7
9	10	11

Editor's Note

Our programming staff has come up with an interesting modification to the expansion demo. First, change the 3 in line 1040 to a 1 to speed up the program execution. Then enter the following program lines and type RUN.

```
80 COLOR 8:FOR I=1 TO 37
82 REM
111 COLOR 2:FOR I=1 TO 13
112 Y=INT(RND(0)*92)+1:X=INT(RND(0)*78)
113 PLOT X,Y*2:DRAWTO X,Y*2+5
114 NEXT I
```

This modification changes the 15 different color "seeds" to 2 colors, blue and orange. There are approximately 75% blue seeds and 25% orange, roughly the same proportions as areas of water and land on the earth. When the modified expansion demo is RUN, it will produce a display that looks remarkably like a planet's surface! Make your own modifications and see what you can come up with.□

Listing 1.

```
5 DIM E$(98)
10 FOR I=1536 TO 1783:READ A:POKE I,A:
NEXT I
20 FOR I=1 TO 98:READ A:E$(I,I)=CHR$(A
) :NEXT I
70 GRAPHICS 11
80 FOR I=1 TO 15
82 COLOR I
90 Y=INT(RND(0)*92)+1:X=INT(RND(0)*78)
100 PLOT X,Y*2:DRAWTO X,Y*2+5
110 NEXT I
120 A=USR(ADR(E$)):GOTO 70
1000 DATA 9,1,2,3,18,8,0,4
1010 DATA 11,7,6,5,1,2,3,9
1020 DATA 8,0,4,10,7,6,5,11
1030 DATA 0,1,80,81,160,161,78,94
1040 DATA 3,169,0,133,220,165,222,56
1050 DATA 233,1,74,133,221,144,2,230
1060 DATA 220,165,223,56,233,1,32,151
1070 DATA 6,24,165,214,101,88,133,212
1080 DATA 165,215,101,89,133,213,24,16
5
1090 DATA 212,101,221,133,212,165,213,
105
1100 DATA 0,133,213,162,0,224,12,240
1110 DATA 28,138,72,74,170,188,24,6
1120 DATA 104,170,177,212,72,74,74,74
1130 DATA 74,149,224,232,104,41,15,149
1140 DATA 224,232,24,144,224,96,162,11
1150 DATA 188,12,6,165,220,240,3,188
1160 DATA 0,6,181,224,153,236,0,282
1170 DATA 16,238,165,237,133,245,165,2
38
1180 DATA 133,246,165,239,133,247,96,1
33
1190 DATA 216,133,215,169,0,133,214,13
3
1200 DATA 217,24,102,215,102,214,102,2
15
1210 DATA 102,214,24,38,216,38,217,38
1220 DATA 216,38,217,38,216,38,217,38
1230 DATA 216,38,217,24,165,214,101,21
6
1240 DATA 133,214,165,215,101,217,133,
215
1250 DATA 96,169,240,133,219,165,220,2
40
1260 DATA 18,230,212,208,2,230,213,169
1270 DATA 15,133,219,6,218,6,218,6
1280 DATA 218,6,218,160,80,177,212,37
1290 DATA 219,5,218,145,212,160,120,17
7
1300 DATA 212,37,219,5,218,145,212,96
1310 DATA 104,173,31,208,201,6,208,1
1320 DATA 96,56,173,10,210,205,31,6
1330 DATA 176,248,133,223,230,223,56,1
73
1340 DATA 10,210,205,30,6,176,248,133
1350 DATA 222,230,222,32,33,6,32,118
1360 DATA 6,165,236,208,212,169,255,13
3
1370 DATA 218,162,1,181,236,197,218,24
0
1380 DATA 4,133,218,160,0,165,218,240
1390 DATA 6,200,204,32,6,240,9,232
1400 DATA 224,12,208,231,169,0,133,218
1410 DATA 165,218,240,173,32,201,6,24
1420 DATA 144,167
```

CHECKSUM DATA
(See p.46)

5 DATA 574,571,939,3,243,788,185,879,7
31,303,818,824,22,636,944,8460
1050 DATA 915,171,224,251,291,910,743,
174,37,28,937,711,529,537,223,6681
1200 DATA 446,212,229,244,309,518,22,9
30,211,240,211,910,727,584,193,5906
1350 DATA 931,285,268,198,865,24,180,9
87,3738

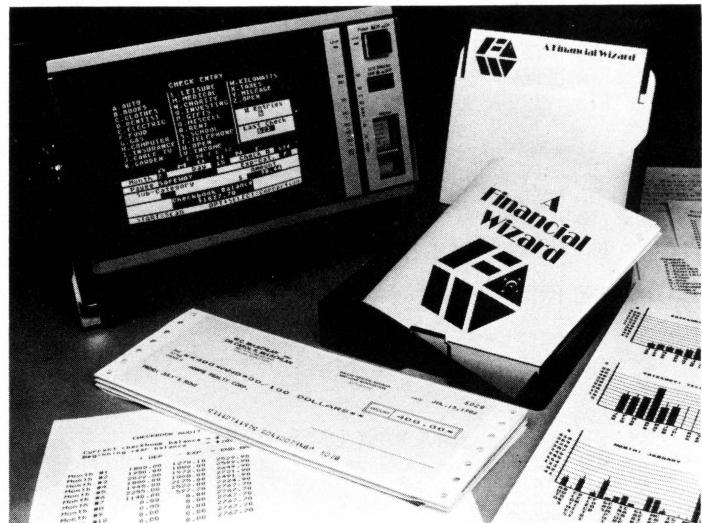
• Listing 2.
Assembly Language Listing

0100 .TITLE GTIA EXPANSION: SHOWS FIELDS OF COLOR
0110 ;
0120 RANDOM = \$D20A
0130 CONSOL = \$D01F
0140 SAVMSC = \$58 ;DP SCREEN POINTER
0150 PTRNTR = \$04 ;SCREEN POINTER WORK
0160 LOWER = \$D6
0170 UPPER = \$D7
0180 LOWER1 = \$D8
0190 UPPER1 = \$D9 ;STORAGE FOR DP NUMBERS
0200 COLOR = \$DA ;COLOR TO PLOT 1-15
0210 MASK = \$DB ;MASK FOR PLOT
0220 ODDFLAG = \$DC ;1 MEANS ODD, 0 EVEN
0230 X1 = \$DD ;TEMP VALUE
0240 XPOS = \$DE ;X POSITION OF 1-78
0250 YPOS = \$DF ;Y POSITION OF 1-94
0255 ;
0260 GROSS = \$E0 ;12 CELLS AROUND POINT
0270 NEIGHBORHOOD=\$EC ;12 CELLS
0275 ;
0280 MAP0 = \$600 ;MAP ODD X
0290 MAPE = \$60C ;MAP EVEN X
0300 DIRWORD = \$618 ;INDEX TO PICK
0305 ;
0310 XMAX = \$61E ;XPOS RANGES TO
0320 YMAX = \$61F ;YPOS RANGES TO
0330 TRIPNO = \$620 ;NUMBER OF ADJACENT
0335 ;
0340 CODE = \$621
0345 ;
0350 *= \$600
0355 ;
0360 .BYTE 9,1,2,3,10,8,0,4,11,7,6,5
0370 .BYTE 1,2,3,9,8,0,4,16,7,8,5,11
0380 .BYTE 0,1,80,81,160,161
0390 .BYTE 78
0400 .BYTE 94
0410 .BYTE 3
0420 ;
0430 NEIGHBORS= *
0440 LDA #0
0450 STA ODDFLAG ;MAKE EVEN
0460 LDA XPOS
0470 SEC
0480 SBC #1
0490 LSR A ;CARRY HAS ODD BIT
0500 STA X1 ;X1=(X-1)/2
0510 BCC EVEN
0520 INC ODDFLAG ;ODD X
0530 EVEN = *
0540 LDA YPOS
0550 SEC
0560 SBC #1
0570 JSR MULT80 ;DP HAS (Y-1)*80
0580 CLC
0590 LDA LOWER
0600 ADC SAVMSC
0610 STA PTRNTR
0620 LDA UPPER
0630 ADC SAVMSC+1
0640 STA PTRNTR+1

0650 CLC
0660 LDA PNTR
0670 ADC X1
0680 STA PNTR
0690 LDA PNTR+1
0700 ADC #0
0710 STA PNTR+1 ;PNTR=(Y-1)*80+X1+SAVMS
0720 LDX #0
0730 NLOOP = * ;FILL GROSS NEIGHBORHOOD
0740 CPX #12
0750 BEQ OUTNLOOP
0760 TXA
0770 PHA ;SAVE X
0780 LSR A ;(X/2)
0790 TAX ;INDEX TO BYTE INDEXES
0800 LDY DIRWORD,X
0810 PLA
0820 TAX ;RESTORE X
0830 LDA (PNTR),Y ;LOAD 2 PIXELS
0840 PHA ;SAVE A COPY
0850 LSR A ;MOVE...
0860 LSR A ;UPPER NIBBLE...
0870 LSR A ;TO
0880 LSR A ;LOWER NIBBLE
0890 STA GROSS,X ;1ST BOX
0900 INX
0910 PLA ;RETRIEVE COPY
0920 AND #\$0F
0930 STA GROSS,X ;2ND BOX
0940 INX
0950 CLC
0960 BCC NLOOP
0970 OUTNLOOP= *
0980 RTS
0990 ;
1000 MAPPING= *
1010 LDX #11
1020 MAPLOOP= *
1030 LDY MAPE,X ;GET THE MAP INDEX EVEN
1040 LDA ODDFLAG
1050 BEQ EVENMAP
1060 LDY MAP0,X ;INDEX ODD
1070 EVENMAP= *
1080 LDA GROSS,X
1090 STA NEIGHBORHOOD,Y ;DO MAPPING
1100 DEX
1110 BPL MAPLOOP
1120 LDA NEIGHBORHOOD+1
1130 STA NEIGHBORHOOD+9
1140 LDA NEIGHBORHOOD+2
1150 STA NEIGHBORHOOD+10
1160 LDA NEIGHBORHOOD+3
1170 STA NEIGHBORHOOD+11 ;ALLOW WRAP AROUND
1180 RTS
1190 ;
1200 MULT80 = *
1210 STA LOWER1
1220 STA UPPER ;*256
1230 LDA #0
1240 STA LOWER
1250 STA UPPER1
1260 CLC
1270 ROR UPPER
1280 ROR LOWER ;*128
1290 ROR UPPER
1300 ROR LOWER ;*64
1310 CLC
1320 ROL LOWER1
1330 ROL UPPER1 ;*2
1340 ROL LOWER1
1350 ROL UPPER1 ;*4
1360 ROL LOWER1
1370 ROL UPPER1 ;*8
1380 ROL LOWER1
1390 ROL UPPER1 ;*16
1400 CLC
1410 LDA LOWER

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1420      ADC LOWER1
1430      STA LOWER
1440      LDA UPPER ;*64 + *16 = *80
1450      ADC UPPER1
1460      STA UPPER
1470      RTS
1480 ;
1490 PLOT = *
1500      LDA #$F0
1510      STA MASK ;MASK UPPER NIBBLE
1520      LDA ODDFLAG
1530      BEQ NOADJUST ;IF X-1 IS EVEN NO ADJUSTMENT
1535          ;TO PTR IS NEEDED
1540      INC PNTR ;OTHERWISE POINT TO
1545          ;NEXT HORIZ BYTE
1550      BNE NOTZ
1560      INC PNTR+1
1570 NOTZ = *
1580      LDA #$0F
1590      STA MASK ;SAVE MASK LOWER NIBBLE
1600      ASL COLOR
1610      ASL COLOR
1620      ASL COLOR
1630      ASL COLOR ;MOVE LOWER TO UPPER NIBBLE
1640 NOADJUST= *
1650      LDY #80 ;MUST POINT TO YPOS LINE
1660      LDA (PNTR),Y
1670      AND MASK
1680      ORA COLOR
1690      STA (PNTR),Y
1700      LDY #120 ;HALF LINE BELOW
1710      LDA (PNTR),Y
1720      AND MASK
1730      ORA COLOR
1740      STA (PNTR),Y
1750      RTS
1755 ;
1760 ; MAIN MODULE
1765 ;
1770 *= $5000
1775 ;
1780 PLA ;FOR BASIC
1790 LOOP = *
1800 LDA CONSOL
1810 CMP #6
1820 BNE CONTINUE
1830 RTS ;RETURN TO BASIC ON START
1840 CONTINUE= *
1850 SEC
1860 GETY LDA RANDOM
1870 CMP YMAX
1880 BCS GETY
1890 STA YPOS
1900 INC YPOS ;YPOS FROM 1-94
1910 SEC
1920 GETX LDA RANDOM
1930 CMP XMAX
1940 BCS GETX
1950 STA XPOS
1960 INC XPOS ;XPOS FROM 1-78
1970 JSR NEIGHBORS ;GET POINT NEIGHBORS GROSS
1980 JSR MAPPING ;MOVE TO CLOCKWISE NEIGHBORHOOD
1990 LDA NEIGHBORHOOD
2000 BNE ;LOOP IF COLORED ALREADY
2010 LDA #$FF ;ENSURE NEW COLOR
2020 STA COLOR
2030 LDX #1 ;START AT UPPER LEFT
2040 TRIPLOOP= *
2050 LDA NEIGHBORHOOD,X
2060 CMP COLOR
2070 BEQ INCR ;MATCH - INCREMENT COUNT
2080 STA COLOR ;NEW COLOR TO START
2090 LDY #0
2100 INCR = *
2110 LDA COLOR
2120 BEQ NOTYET ;NO INCR ON 0 COLOR
2130INY
2140      CPY TRIPNO ;3 IS A TRIPLET
2150      BEQ HAVEIT
2160 NOTYET = *
2170      INX ;MOVE CLOCKWISE
2180      CPX #12
2190      BNE TRIPLOOP
2200      LDA #0
2210      STA COLOR
2220 HAVEIT = *
2230      LDA COLOR
2240      BEQ LOOP ;IF NO TRIPLET
2250      JSR PLOT
2260      CLC
2270      BCC LOOP
2275 ;
2280      .END

```

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THE NEW ATARI COMPUTERS!

by Lee Pappas

In recent months Commodore has slashed the prices on their VIC-20 and 64 computers. The Texas Instruments 99/4A price tag reads like a novice's score on Donkey Kong. As one of the editors of A.N.A.L.O.G., it's amazing how much worry I sense from most ATARI (and even non-ATARI) owners. What is ATARI going to do?

Well, for starters, 4 (four!) new computers have been announced: the **600XL**, **800XL**, **1400XL**, and the **1450XLD**. These represent ATARI's new main line of CPUs. All resemble the modern styling set forth by the 1200XL, all units have serial and processor-bus interfaces on the back, and all are still 8-bit machines.



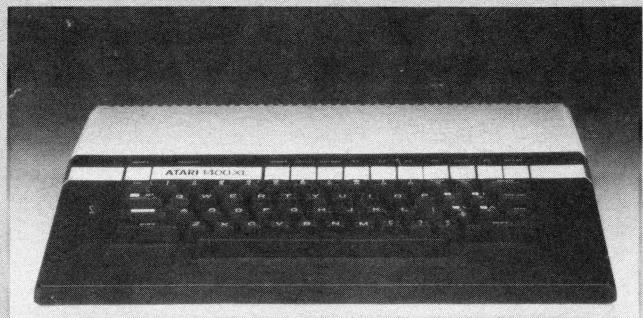
600XL

The **600XL** is scheduled to retail below \$200 and is shipped with 16K of RAM, upgradable to 64K using an expansion module from ATARI(!).

Then there is the **800XL**, which comes with 64K and should be priced around \$300. There are even rumors of third-party companies releasing memory modules to increase RAM to 192K. The **1400XL** is also a 64K machine, with the addition of a built-in modem and voice synthesizer. (Great stuff!) This CPU should sell for about \$500.



800XL



1400XL

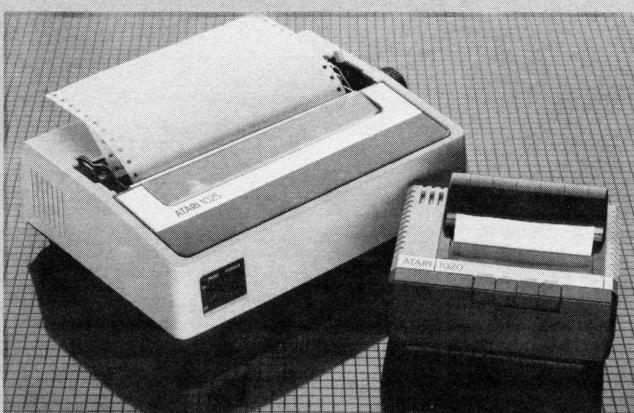
The new flagship (flagcomputer?) of the ATARI line is the **1450XLD** (whew!). This too is a 64K machine with a BUILT IN double sided/double density disk drive, modem, and voice synthesizer. But that's not all... The disk drive data-transfer rate is 2 1/2 times faster than the 810 drive, and there is room in the **1450XLD** to add another similar drive. I feel the most incredible feature of this unit is the price — scheduled to be under \$1000; probably at \$899! At this time there is NO OTHER computer on the market that can match the feature-to-price capability of this computer.

**1450XLD**

The **600XL** should be on your dealer's shelves by September, followed by the **800XL** later in the month, and the **1400XL** and **1450XLD** in the fourth quarter. All four machines are fully compatible with the **400/800** — even more so than the **1200XL** is. Also, all of the operating system bugs in the **1200XL** format have been removed. Rumors are that the **400**, **800**, and even the recently released **1200XL** will be phased out as the new machines become available. However, ATARI promises that all of the new software will work on the current machines.

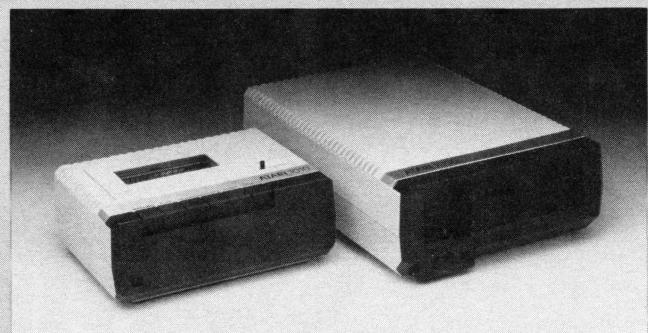
That's Not All, Folks

Along with the new computers comes an array of interesting new hardware with comparable styling. In issue #9 of **A.N.A.L.O.G.** we mentioned the **ATARI 1020 COLOR PRINTER/PLOTTER** and the **1025 80 COLUMN PRINTER**. Newly announced is the **1027 LETTER QUALITY PRINTER**. This is NOT a dot matrix printer, but a high quality print style with a cylinder/impact print head. The price should be under \$400 (read \$349). Print speed runs at 20 characters/second, however at this price and print quality, that slowness shouldn't be an important factor.



To complement the new **1010 PROGRAM RECORDER** is the **1050 DISK DRIVE**, originally to be shipped with DOS II, then later in the year with DOS III which allows the drive to run at double density. Incidentally, DOS III utilizes the

HELP key (a feature all of the new computers have) to assist in DOS III menu selection. The printers and storage devices will also work on the **400/800/1200XL** computers.



The new **EXPANSION MODULE** boasts 8 ports, along with 2 RS-232 hookups and a bi-directional parallel interface.

Many of us have been craving for the ability to run **CP/M** programs on the **ATARI** computers. The new **CP/M EXPANSION MODULE** works with all the current and soon to be released computers with the exception of the **400**. The unit will probably hook up through the serial line. This module allows you to run an incredible number of professional and high-quality business programs on the **ATARI**.

Another new piece of hardware the **1030 DIRECT CONNECT MODEM**, featuring auto-dial from the keyboard, autoanswer, and pulse and touchtone dialing modes. The new modem also includes a memory buffer and printer on/off switching. The **1030** works with both **Teleslink I** and **II**.

The new **CX60 SUPERJOYSTICK** is self-centering and is made of high quality contact switches with 2 firing buttons (for right or left handed users). The **CX40** is a **REMOTE CONTROL** joystick, and the **CX80** is a **TRACKBALL** controller replicating those in the arcades. A new type of "controller," the **CX77 TOUCH TABLET** allows you to use either a pen or your finger to draw or input data to the computer. This supplements the **CX85** numeric keypad already on the market. A lightpen may also be available in the near future.

Again, with few exceptions, all of this hardware will work with the **400/800/1200XL**. ATARI has also announced the availability in the near future of their own **48K RAM** board for the **400**. If ATARI starts filling in the gaps (especially in the memory department—see editorial in issue #11) this will leave the 3rd party companies, which up to now developed **400/800** expansion memory boards, out in the cold.

Next issue we will report on other new announcements from the Summer Consumer Electronics Show in Chicago. Fear not, loyal **ATARI** fans, the computer age is just beginning and **ATARI** is ready to lead the way. □



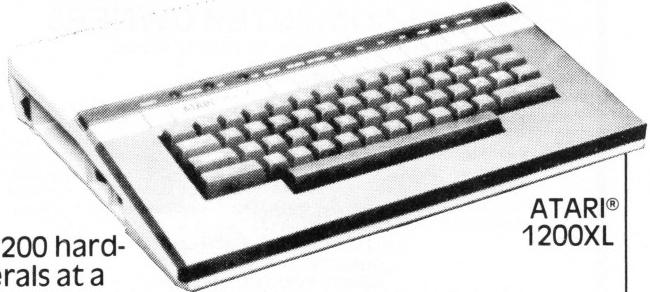
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16K cassette 24K disk

by Sheila Neece Spencer

After spending countless hours experimenting with sounds on my ATARI, I finally got tired of running the cursor back and forth to make changes in pitch, distortion, loops, etc. And almost invariably when I got a sound I really liked, I found I had no way to get it back — since I had been experimenting in immediate mode and had carelessly let the sound statements scroll off the top of the screen!

I got just as tired of writing short programs for sound generation — so instead I wrote the Sound Effector, which does all the work for me — and shows me exactly what program made that terrific sound.

The program is quite straightforward. You are asked to input values for pitch, distortion, and volume. (If you intend to run any of these values through a loop, you may enter any number you wish at this point.)

You will then be asked if you want any loops. If you respond with a "Y" to any of the loops, you will be asked for "FROM" and "TO" values, as well as a "STEP" value.

The program runs the values, with loops, and if you have used more than one loop, informs you which loop is the inner one and which the outer. You should make notes of this in case you like what you hear and want to use it in another program. After each sound you will be asked if you want to hear the sound again. An "N" will allow you to see the values you used — on your screen or printer. You can then go on to the next sound (or automatically to the next loop configuration) or end the program.

I've enjoyed experimenting with the program, and have come up with some pretty interesting sounds that I'm sure I wouldn't have gotten working in my usual haphazard way! □

```

5 OPEN #2,4,0,"K":POKE 752,1:GOSUB 10
 000
9 CLOSE #3:TRAP 11000
10 ? "R++Do you want listings to the s
creen (1)or printer (2)?":GET #2,OUT
15 IF OUT=50 THEN OPEN #3,8,0,"P":POK
E 752,1
16 IF OUT=49 THEN OPEN #3,8,0,"E":POK
E 752,1
20 ? "R++What pitch":INPUT PIT:?"Wha
t distortion":INPUT DIS:?"What volum
e":INPUT VOL
50 ? "R++Do you want any loops?":GET
#2,A:IF A<>89 THEN 300
70 ? "R++Want a pitch loop?":GET #2,A
:IF A<>89 THEN 120
90 ?:?:?"Pitch loop - from":INPUT
PL1:?"to":INPUT PL2
110 ?:?"step":INPUT PL3:IF PL3=0 THEN
?:?"0 CANNOT BE USED AS A STEP VALUE
!":? :GOTO 110
120 ? "R++Want a distortion loop?":GE
T #2,A:IF A<>89 THEN 170
140 ?:?"Distortion loop - from":INPUT
DL1:?"to":INPUT DL2
160 ?:?"step":INPUT DL3:IF DL3=0 THEN
?:?"0 CANNOT BE USED AS A STEP VALUE
!":? :GOTO 160
170 ? "R++Want a volume loop?":GET #2
,A:IF A<>89 THEN 230
190 ?:?"Volume loop - from":INPUT
VL1:?"to":INPUT VL2
210 ?:?"step":INPUT VL3:IF VL3=0 THEN
?:?"0 CANNOT BE USED AS A STEP VALUE
!":? :GOTO 210
230 IF PL3 AND NOT DL3 AND NOT VL3 T
HEN 330
240 IF DL3 AND NOT PL3 AND NOT VL3 T
HEN 380
250 IF VL3 AND NOT PL3 AND NOT DL3 T
HEN 430
260 IF PL3 AND DL3 AND NOT VL3 THEN 5
00
270 IF PL3 AND VL3 AND NOT DL3 THEN 6
10
280 IF DL3 AND VL3 AND NOT PL3 THEN 7
20
290 GOTO 830
300 SOUND 0,PIT,DIS,VOL:FOR TIME=1 TO
100:NEXT TIME:?:?:?"This was for so
und with no loops.":GOSUB 1200
305 IF A=89 THEN 300
310 IF A<>89 THEN ?:?"Do you want to
see the values used?":GET #2,A

```

```

311 IF A<>89 THEN 470
312 ? #3:? #3;"Pitch=";PIT:? #3;"Distortion=";DIS:#3;"Volume=";VOL
320 GOSUB 1290:GOTO 470
330 ? "R":FOR PIT=PL1 TO PL2 STEP PL3: SOUND 0,PIT,DIS,VOL:NEXT PIT:GOSUB 120
0:IF A=89 THEN 330
360 GOSUB 1210:GOTO 470
380 ? "R":FOR DIS=DL1 TO DL2 STEP DL3: SOUND 0,PIT,DIS,VOL:NEXT DIS:GOSUB 120
0:IF A=89 THEN 380
410 GOSUB 1210:GOTO 470
430 ? "R":FOR VOL=VL1 TO VL2 STEP VL3: SOUND 0,PIT,DIS,VOL:NEXT VOL:GOSUB 120
0:IF A=89 THEN 430
460 GOSUB 1210
470 SOUND 0,0,0,0?: "R++Want another sound?":GET #2,A:IF A=89 THEN CLR :GOTO
20
490 END
500 ? "R++The pitch loop is the inner loop.":FOR DIS=DL1 TO DL2 STEP DL3:FOR
PIT=PL1 TO PL2 STEP PL3
510 SOUND 0,PIT,DIS,VOL:NEXT PIT:NEXT
DIS:GOSUB 1200:IF A=89 THEN 500
540 GOSUB 1210
550 ? "R++The distortion loop is the inner loop.":FOR PIT=PL1 TO PL2 STEP PL
3:FOR DIS=DL1 TO DL2 STEP DL3
560 SOUND 0,PIT,DIS,VOL:NEXT DIS:NEXT
PIT:GOSUB 1200:IF A=89 THEN 540
590 GOSUB 1210:GOTO 470
610 ? "R++The pitch loop is the inner loop.":FOR VOL=VL1 TO VL2 STEP VL3:FOR
PIT=PL1 TO PL2 STEP PL3
620 SOUND 0,PIT,DIS,VOL:NEXT PIT:NEXT
VOL:GOSUB 1200:IF A=89 THEN 610
650 GOSUB 1210
660 ? "R++The volume loop is the inner loop.":FOR PIT=PL1 TO PL2 STEP PL3:FO
R VOL=VL1 TO VL2 STEP VL3
670 SOUND 0,PIT,DIS,VOL:NEXT VOL:NEXT
PIT:GOSUB 1200:IF A=89 THEN 660
700 GOSUB 1210:GOTO 470
720 ? "R++The distortion loop is the inner loop.":FOR VOL=VL1 TO VL2 STEP VL
3:FOR DIS=DL1 TO DL2 STEP DL3
730 SOUND 0,PIT,DIS,VOL:NEXT DIS:NEXT
VOL:GOSUB 1200:IF A=89 THEN 720
760 GOSUB 1210
770 ? "R++The volume loop is the inner loop.":FOR DIS=DL1 TO DL2 STEP DL3:FO
R VOL=VL1 TO VL2 STEP VL3
780 SOUND 0,PIT,DIS,VOL:NEXT VOL:NEXT
DIS:GOSUB 1200:IF A=89 THEN 770
810 GOSUB 1210:GOTO 470
830 ? "R++The pitch loop is the innermost loop, the volume loop the outermost."
840 FOR VOL=VL1 TO VL2 STEP VL3:FOR DI
S=DL1 TO DL2 STEP DL3:FOR PIT=PL1 TO PL
2 STEP PL3
850 SOUND 0,PIT,DIS,VOL:NEXT PIT:NEXT
DIS:NEXT VOL:GOSUB 1200:IF A=89 THEN 8
30
880 GOSUB 1210
890 ? "R++The volume loop is the innermost loop, the distortion loop the outermost."
900 FOR DIS=DL1 TO DL2 STEP DL3:FOR PI
T=PL1 TO PL2 STEP PL3:FOR VOL=VL1 TO VL
2 STEP VL3
910 SOUND 0,PIT,DIS,VOL:NEXT VOL:NEXT
PIT:NEXT DIS:GOSUB 1200:IF A=89 THEN 8
90
940 GOSUB 1210
950 ? "R++The distortion loop is the innermost loop, the pitch loop the outermost."
960 FOR PIT=PL1 TO PL2 STEP PL3:FOR VO
L=VL1 TO VL2 STEP VL3:FOR DIS=DL1 TO DL
2 STEP DL3
970 SOUND 0,PIT,DIS,VOL:NEXT DIS:NEXT
VOL:NEXT PIT:GOSUB 1200:IF A=89 THEN 9
50
1000 GOSUB 1210
1010 ? "R++The distortion loop is the

```

innermost loop, the volume loop the outermost."
1020 FOR VOL=VL1 TO VL2 STEP VL3:FOR P
IT=PL1 TO PL2 STEP PL3:FOR DIS=DL1 TO
DL2 STEP DL3
1030 SOUND 0,PIT,DIS,VOL:NEXT DIS:NEXT
PIT:NEXT VOL:GOSUB 1200:IF A=89 THEN
1040
1060 GOSUB 1210
1070 ? "R++The volume loop is the innermost loop, the pitch loop the outermost."
1080 FOR PIT=PL1 TO PL2 STEP PL3:FOR D
IS=DL1 TO DL2 STEP DL3:FOR VOL=VL1 TO
VL2 STEP VL3
1090 SOUND 0,PIT,DIS,VOL:NEXT VOL:NEXT
DIS:NEXT PIT:GOSUB 1200:IF A=89 THEN
1070
1120 GOSUB 1210
1130 ? "R++The pitch loop is the innermost loop, the distortion loop the outermost."
1140 FOR DIS=DL1 TO DL2 STEP DL3:FOR V
OL=VL1 TO VL2 STEP VL3:FOR PIT=PL1 TO
PL2 STEP PL3
1150 SOUND 0,PIT,DIS,VOL:NEXT PIT:NEXT
VOL:NEXT DIS:GOSUB 1200:IF A=89 THEN
1130
1180 GOSUB 1210:GOTO 470
1200 SOUND 0,0,0,0?: ?: ?: "Do you wan
t to hear that again?":GET #2,A:RETURN
1210 ? ?: "Do you want to see the val
ues used?":GET #2,A?: ?: :IF A<>89 THEN
RETURN
1230 IF PL3 THEN ? #3;"Pitch=";PL1;" t
0 ";PL2;" step ";PL3:GOTO 1250
1240 ? #3;"Pitch=";PIT
1250 IF DL3 THEN ? #3;"Distortion=";DL
1;" to ";DL2;" step ";DL3:GOTO 1270
1260 ? #3;"Distortion=";DIS
1270 IF VL3 THEN ? #3;"Volume=";VL1;" to
";VL2;" step ";VL3:GOTO 1290
1280 ? #3;"Volume=";VOL
1290 POSITION 8,20?: "PRESS ANY KEY TO
CONTINUE":GET #2,A:RETURN
10000 ? "R":POSITION 13,0?: "SOUND EFF
ECTOR"
10001 ? "++This program allows you to
set up complicated sounds using lo
ops in the pitch, distortion, ";
10005 ? "and/or volume of a sound. E
ach loop will be set up in every possi
ble combination so that you";
10010 ? " can pick the sound you like
best for your application. After all
variations have been ";
10015 ? "played, you will be given a l
isting of how the sounds were achi
eved, to your printer ";
10020 ? "if you so specify. You can t
hen use the sounds you have built
in your own programs."
10025 POSITION 8,22?: "PRESS ANY KEY T
O CONTINUE":GET #2,Z:RETURN
11000 ? "ERROR #";PEEK(195);"--PRESS A
NY KEY TO TRY AGAIN":GET #2,Z:GOTO 9

•

CHECKSUM DATA (See p.46)

```

5 DATA 836,675,25,628,604,805,782,690,
380,490,117,709,484,453,914,8592
210 DATA 512,703,697,705,132,121,128,7
35,454,438,741,738,729,898,523,8254
360 DATA 894,407,881,592,815,845,59,74
8,109,811,148,136,907,889,128,8369
650 DATA 816,967,158,884,195,123,821,8
61,153,889,372,595,387,829,486,8536
900 DATA 555,395,819,475,600,403,927,2
69,780,645,933,287,789,663,932,9472
1130 DATA 163,797,655,100,931,4,737,22
1,981,100,34,202,64,33,88,5110
10005 DATA 917,500,730,424,336,445,335
2

```

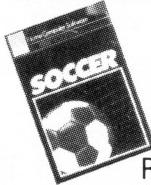
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DE RE LETTER PERFECT

(almost)

by Arthur Leyenberger

Letter Perfect by LJK has become the premier word processor for the ATARI computer for many reasons. One particular reason is its versatile ability to be used in conjunction with just about any printer imaginable. With this flexibility, however, comes complexity. My goal is that this article be helpful to the first-time user of LJK's Letter Perfect (LP) word processor. I am using LP right now with the Bit-3 80-column board and a green phosphor monitor, and although I have only had the program for a short time, I like it. However, the first few times I used the program I had fits. Hopefully, by sharing my experiences, you will be spared the hassles and your first attempt at using LP will a successful one. Also, I will present information on using the disk printer editor to configure a printer driver for the NEC 8023 and C. Itoh 8510 (Prowriter) printers.

First, LP does not use ATARI DOS, consequently disks that have been formatted with DOS will not work with LP. Therefore, you must format a disk using the Format Disk option of the main menu. Before you even get to that point, there are a few things that first need attending to. For you folks (like me) who have the disk version of Letter Perfect, turn the computer off and the disk drive on, remove any cartridge from your computer and boot up the LP disk (not the disk marked "disk printer editor" - I'll get to that in a while) by inserting the LP disk into the disk drive, closing the door and switching the computer on.

You will now see a cryptic prompt: "(EADQ)." The E, A and Q represent Epson, ATARI 825 (or Centronics 737 or Centronics 739), and Qume or Diablo printers, respectively. If you are using one of these printers, press the appropriate key, otherwise press D which stands for disk printer editor. For now, the best approach is to press D and then press return. The next two questions refer to which disk drive will contain your files and which will contain your database (if you are doing a mail merge). Since I only have one drive, I press return after each of these questions for the default option of 1 disk drive. Now you will see the main menu. The "<" key scrolls the menu pointer up to the top of the screen and the ">"

scrolls the pointer down to the bottom of the screen. When using either key and the top or bottom has been reached, the pointer wraps around to the opposite end of the menu. Once you have positioned the menu pointer to the desired selection, you must then press the return key to actually request that option.

Let's assume you have formatted a disk, this disk is now in your drive, and you are still looking at the main menu wondering what all this stuff means. The most often-used menu options are Editor, Load, Save, Printer and Change Parameters.

To get started using the program, position the menu pointer to the Editor option and press return. You are now faced with a blank screen. The first line of your text should always be a format line. The format line is begun with a control-F, (it will appear as inverse video) and it allows you to set margins, fonts, line spacing, headers and footers and other things. If you don't specify a format line, the program will use default values for all of these (see page 33 of the LP manual for more information). I always use a format line because I want to know what the values of these options will be.

I will mention just a few options and their values to get you started. Assume your paper is 8- 1/2 inches wide and you want a one inch left and right margin. Also, you will be using pica print (which is 10 characters per inch or 10 pitch.) You should then specify the left margin (m) as 10 and the line width (w) as 65. Remember, 10 characters/inch, so a one inch left margin equals 10 characters. Likewise, a 65 character width will be equal to 6-1/2 inches. There is no need to specify the right margin since whatever remains from 8-1/2 inches automatically becomes the right margin.

Another useful option is line spacing (l). Line spacing may be from 1 to 5 lines. For term papers, business reports and articles submitted to magazines, use a line spacing of 2. For letters, use a line spacing of 1. Finally, if you want your text printed with right justification (as in this magazine, or simply to look nice) then use the justify option (j) with a value of 1. A value of 0 means no justification. These options

and all others are specified by pressing the lower case letter representing the option followed by the value. The following is the above mentioned format line as it would appear as the first line of your LP file. (The underlined F represents a control-F).

Fm10w6511j1

Be sure to press return after this first line. You are now ready to begin typing. Just remember that, unlike a typewriter where you press return after each line, in LP you just keep on typing and only press return at the end of a paragraph or where you want to end a specific line on the printer. Once you have finished typing your text (or about every five minutes worth of work), you should press the escape (ESC) key which will bring you back to the main menu. Then, position the menu pointer to the Save option, and press the return key. Now type a file name of up to 8 characters in length. You can not use a file name extension because Letter Perfect automatically puts an ".LP" at the end of your specified name. After the file has been saved, LP places you back at the main menu. Loading a file from disk is done in a similar way. Don't forget, when you are in the Editor mode, pressing the (ESC) key brings you back to the main menu and when you are in the main menu mode, you make your menu selection via the "<" or ">" keys and then pressing return.

So far I have talked about the main menu, the Editor mode, and loading and saving files. I will now discuss how to print your text on your printer. First, configure the disk printer editor with the specific codes that are required by your printer. It is a relatively straightforward procedure. What you are doing is setting up a little file on your disk (the disk that will hold all of your text files). The print driver tells LP what ASCII codes to send to your printer to do specific things. For example, on my C. Itoh printer the underline-on and underline-off codes are 27,88 and 27,89, respectively. Once this has been specified to LP, I simply use a control-U to toggle the underline on and off within my text.

Now that you know **what** you are doing, let me briefly tell you **how** to do it. Boot up the Disk Printer Editor Disk and answer the question as to what type of printer you have (read pages 76 through 88 in the LP manual at least once before you attempt to do this). Note that item 5, NEC, refers to the NEC Spinwriter printers, not the NEC 8023 dot matrix printer. Generally, the way this process works is for you to select a numbered option, press the return key and then change or enter the values associated with that printer function. You then press the return key to save those values and continue.

When the main menu comes up I select option 6 because I have a C. Itoh 8510 Prowriter printer. I am then given an opportunity to change some default values concerning things like margins, type fonts, etc. Pressing return instead of an option number

brings up the next questions. I then accept the default values for double width printing and back-space character by pressing return twice. The program then asks for boldface on/off and underline on/off. I respond with the codes — 27,33/27,34 and 27,88/27,89, respectively. I now press return and come to the font questions. Up to four fonts may be described and they are numbered 0 through 3. The following are the fonts I can use on my printer and their codes: Pica (10 pitch) — 27,78; Elite (12 pitch) — 27,69; Condensed (17 pitch) — 27,81; and Proportional — 27,80. I press return once more and then I make sure my file disk is in the disk drive. Then I press shift-3, which records the above information on the disk and returns me to the Disk Printer Editor main menu once again. At this point I could configure another printer driver but I would have to answer all of the questions all over again. It would have been nice if my previously entered values remained, allowing me to modify just what I need to in order to configure another printer driver. By the way, only one print driver may be stored on each side of the disk.

When you are finished with the Disk Printer Editor, you'll want to return to the Letter Perfect program to actually print the masterpiece. To do this, insert your LP disk in the drive and select menu option 7 (exit) and follow the instructions. When the prompt (EADQ) appears, insert your file disk containing the printer driver, press D and then press shift-3. This will load the printer driver. For a one-drive system, press return twice and select the Load menu option. When LP requests it, type in your text file name and press return. You can now go back to the Editor mode to add, delete or modify your text or, if you want to print it, select the Printer menu option. Press return twice, adjust the paper and press return again. Your text is now printing on your printer. If not, ensure that your printer is on, it is in the select mode, it is connected correctly to the 850 interface, the interface is on and connected correctly to your ATARI computer. From now on, when you see the "EADQ" after booting up LP, insert your text file disk, press "D", and then press "#". This will load your printer driver which will be active for the entire session or until changed.

This article may have seemed a bit long-winded, but had I the advantage of reading the information contained herein when I first started using LP, I would have saved myself many hours of frustrating trial and error activity. There is much I have not covered in this article but this outline should at least get you started. The bells and whistles can come later. I am still learning too. As yet I can't do sub- and superscripting and right justified proportional printing. I also seem to have trouble with my paging, after altering the top and bottom margins when using a header. I'll just have to keep working on it. □

ATARI**PUZZLE**

by Marcy Caruthers

Here is a little word search puzzle incorporating some elementary and some advanced words for your ATARI vocabulary. (**Answers on page 93**)

ABS	INPUT
ASC	LEN
AND	LET
ANTIC	LIST
ATARI	MANTISSA
BASIC	MISSILE
BIT	NEW
BREAK	NOT
BYE	OPEN
BYTE	PTRIG
CLOG	PEEK
CLR	PLAYER
CPU	PLOT
CHIP	POKE
CLOAD	POKEY
CLOSE	POP
CONTROL	PRINT
CSAVE	RAM
DIM	REM
DMA	RND
DOS	ROM
DATA	RESTORE
DELETE	RUN
DRAWTO	SGN
END	SETCOLOR
ENTER	SOUND
FRE	STATUS
FLOPPY	STICK
FOR	STOP
GTIA	TRAP
GOTO	THEN
GRAPHICS	VAL

C O N T R O L L E P A D A M E R U N B R
I K Y P P O L F D O A S V I D R A Y R C
C L O A D Y G R A P H I C S C A T R U R
T H E R S D D E O T C S P S J E B V O R
I L O V E I T H E S E A V I E W J B O O
M D O S C M K W G O L C T L T C O L M M
P E M U T E E D T G R D R E S T O R E E
L L T A O R N B I O M J C P D C L E N T
X E C N V E U T A T A R I X T J I X Y L
E T Z D A T A M B O A T R E I D E T I E
Y E R Q D O R M A N T I S S A N T S N T
B I T W U N T Q J R P Z M A R E T C Y A
R L C E D A R E A R B I T O L P K D A V
E I O D E K O P S A O T M M P O K E Y E
A R N S A E F R S U L U T N L O V E M B
K E T R J E U I L Y C P U J A B S U P C
K N R E D P C N S L A N I L Y E T R T L
C T O N Z L H T H E N I R B E U A Y R O
I F U A A T I H E N E N T E R E T R I S
T O S V T H P D R A W T O O M A U S G E
S G N C C S A V E B U D E L E Y S T O P

WHAT IS D:CHECK/C:CHECK

Most program listings in **A.N.A.L.O.G.** are followed by a table of numbers appearing as DATA statements, called "CHECKSUM DATA." These numbers are to be used in conjunction with D:CHECK, which appeared in issue no. 10, and C:CHECK, which appeared in issue no. 11.

D:CHECK and C:CHECK are programs by Istvan Mohos and Tom Hudson. They are designed to find and correct typing errors when entering programs from the magazine. For those readers who do not have a copy of either article, send a pre-addressed, stamped, business-sized envelope to:

D:CHECK ARTICLE
P.O. BOX 23
WORCESTER, MA 01603

CONTROL CHARACTERS

Some program listings reproduced in **A.N.A.L.O.G.** may contain "strange" characters not shown on the ATARI keyboard. These are special characters which use the CTRL, ESC and "ATARI LOGO" (INVERSE) keys. Shown below is a list of these characters and the keystrokes used to get them. □

♥ --- CTRL ,	L --- CTRL Z	■ --- INVERSE CTRL M
† --- CTRL A	E --- ESC ESC	■ --- INVERSE CTRL N
‡ --- CTRL B	↑ --- ESC CTRL UP-ARROW	■ --- INVERSE CTRL O
§ --- CTRL C	↓ --- ESC CTRL DOWN-ARROW	■ --- INVERSE CTRL P
¤ --- CTRL D	↔ --- ESC CTRL LEFT-ARROW	■ --- INVERSE CTRL Q
¬ --- CTRL E	→ --- ESC CTRL RIGHT-ARROW	■ --- INVERSE CTRL R
› --- CTRL F	♦ --- CTRL :	■ --- INVERSE CTRL S
› --- CTRL G	¤ --- CTRL ;	■ --- INVERSE CTRL T
› --- CTRL H	¤ --- ESC SHIFT CLEAR	■ --- INVERSE CTRL U
‐ --- CTRL I	◀ --- ESC BACK S	■ --- INVERSE CTRL V
‐ --- CTRL J	▶ --- ESC TAB	■ --- INVERSE CTRL W
‐ --- CTRL K	■ --- INVERSE CTRL ,	■ --- INVERSE CTRL X
‐ --- CTRL L	■ --- INVERSE CTRL A	■ --- INVERSE CTRL Y
‐ --- CTRL M	■ --- INVERSE CTRL B	■ --- INVERSE CTRL Z
‐ --- CTRL N	■ --- INVERSE CTRL C	↑ --- ESC DELETE
‐ --- CTRL O	■ --- INVERSE CTRL D	↓ --- ESC INSERT
‐ --- CTRL P	■ --- INVERSE CTRL E	↔ --- ESC CTRL TAB (CLR)
‐ --- CTRL Q	■ --- INVERSE CTRL F	→ --- ESC SHIFT TAB (SET)
‐ --- CTRL R	■ --- INVERSE CTRL G	■ --- INVERSE SPACE
‐ --- CTRL S	■ --- INVERSE CTRL H	■ --- INVERSE _
‐ --- CTRL T	■ --- INVERSE CTRL I	■ --- INVERSE CTRL .
‐ --- CTRL U	■ --- INVERSE CTRL J	■ --- INVERSE CTRL ;
‐ --- CTRL V	■ --- INVERSE CTRL K	■ --- INVERSE !
‐ --- CTRL W	■ --- INVERSE CTRL L	■ --- ESC CTRL 2
‐ --- CTRL X		■ --- ESC CTRL BACK S
‐ --- CTRL Y		■ --- ESC CTRL INSERT

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NOTES TO THE ATARI MICROSOFT BASIC INSTRUCTION MANUAL

by Gerald L. Despain

Rare indeed in the computer industry is the user's manual that answers every question. I have been using the ATARI Microsoft BASIC product for some time now. This is a good product that provides many advantages over the original 8K ATARI BASIC. The manual is good, but it does leave some unanswered questions. I have made a number of corrections, additions or notes in the margins of my manual. I believe these will be useful to others with this product.

The following comments apply to the manual CO16083-26 Rev. 1, documenting version 1.0. One errata sheet (printed on golden rod paper) has been issued by ATARI. Beware! Some of these notes may be documenting bugs that may be corrected or features that may be changed in future versions of the software. Where a note applies will be specified by the page number and the number of centimeters down the page from the horizontal rule at the top of each page. □

Inside front cover

Insert index to DEFSNG 10, DEFDBL 10, DEFINT 11, and DEFSTR 13.

Page 15, insert at centimeter 12:

If a relationship is false, a zero number will result. If a relationship is true, the number -1 will result. The actual non-zero value may be important in some expressions involving logical operators.

Page 17, change at centimeter 5:

If it is a binary 0 (all bits off) it becomes a binary -1 (all bits on) after this logical operation.

Page 17, insert at centimeter 14:

Note: The results of expressions involving logical operators do not always follow one's intuition. For the IF statement, zero means false and non zero means true. However, if A%=&0001 then A% is true but, since NOT A% is &FFFE (all bits on except one) then NOT A% is also true. Similarly if A%=1 and B%=2 then A is true, B is true, but A AND B is false. Thus, if a variable is to be used as a switch variable in operations like IF A% and IF NOT A%, then the value -1 should be used for true.

Page 30 insert at centimeter 15:

If any change is made to the program, it cannot be CONTinued. All variables will have been reset, including COMMON variables.

Page 34 change at centimeter 9:

Format: ON ERROR (GOTO) line number

Page 36 insert at centimeter 5:

The following example illustrates using RESUME from direct mode:

```
10 ON ERROR 40
20 OPEN #3,"P:" OUTPUT
30 GOTO 50
40 PRINT "Enable printer, then type RE
SUME":STOP
50 !
```

Page 38 insert at centimeter 21:

Space for only one character set can be allocated using OPTION CHR1 or CHR2. Invoking a second OPTION CHRN invalidates the previous OPTION CHRN.

Page 39 insert at centimeter 4:

Only one reserved area may be allocated with OPTION RESERVE. Invoking a second OPTION RESERVE invalidates the previous RESERVE.

Page 39 insert at centimeter 19:

Care must be taken in doing arithmetic on addresses returned with VARPTR. When using integer variables, addresses from hex &0000 to &7FFF are positive integers. Addresses from &8000 to &FFFF are negative integers. Adding an offset of say &20 to &7FF0 will cause an overflow error. The following illustrates one way to do address arithmetic and avoid overflows:

```
10 ! Illustrate address arithmetic
15 ! test mod routine
20 BX=&1000:CX=AX:GOSUB 250:GOSUB 90:P
PRINT CX;CS
25 ! test add routine near 32K
30 FOR BX=-4 TO 4:CX=&7FFE:GOSUB 1700:
GOSUB 90:PRINT BX;CX;CS:NEXT BX
35 ! test add routine near 64K
40 FOR BX=-4 TO 4:CX=&FFFE:GOSUB 1700:
GOSUB 90:PRINT BX;CX;CS:NEXT BX
50 END
60 !
70 ! this routine converts the value i
n CX to hex in CS.
```

```

80 !
90 C$="" :D$="0123456789ABCDEF"
100 C2%=(CX AND &F000)/4096:IF C2%<0 T
HEN C2%=16+C2%
110 C$=C$+MID$(D$,C2%+1,1)
120 C$=C$+MID$(D$, (CX AND &0F00)/256+1
130 C$=C$+MID$(D$, (CX AND &00F0)/16+1,
140 C$=C$+MID$(D$, (CX AND &000F)+1,1)
150 RETURN
160 !
170 ! This routine adds BX to CX doing
address style arithmetic.
180 ! (memory addresses above 32K are
negative)
190 ! Restrictions: -32767 < BX < 3276
200 !
210 IF CX<0 THEN CX=CX+BX:RETURN
220 IF (&7FFF-CX)<BX THEN CX=BX-&7FFF
-CX)+&8000 ELSE CX=CX+BX
230 RETURN
240 !
250 ! This routine resets CX to the ne
xt address greater than CX on a Mod BX
boundary.
260 !
270 CX=(CX AND (1-BX)):GOTO 170

```

Page 42 change example at centimeter 16:

```

100 OPEN #3,"D:TEST.DAT" OUTPUT
110 NOTE #3,5%,BX
120 PRINT #3,AT(5%,B$) "TEST";
130 CLOSE #3

```

Page 42 insert at centimeter 20:

AT can be used only once per PRINT statement and must be the first item following the IOCB number.

Page 43 insert at centimeter 2:*

If the position specified by TAB precedes the current print position, it will go to the next line at the specified TAB position.

Page 43 insert at centimeter 14:

TAB, SPC and AT cannot be used in a PRINT USING statement. The general format for PRINT USING is illustrated by the following example:

```
10 PRINT #3,USING "X= , Y= ";X;Y
```

Page 47 change at centimeter 15:

Format: LINE INPUT (=iocb) ("prompt_string");
string_variable_name\$

Page 48 insert at centimeter 6:

Quotes can be entered by the double quote convention.

Page 49 change at centimeter 20:

#6 is used for INPUT and OUTPUT to S:, the screen itself, in text modes of GRAPHICS 1 and GRAPHICS 2.

Page 59 insert at centimeter 16:

If the third parameter is missing, all the remaining characters in the string will be returned.

Page 62 insert at centimeter 13:

In graphics mode, SCRNS returns a null string if the color register is zero.

Page 67 insert at centimeter 7:

Default Colors

Register	Hue	Luminance	Description
0-3,8	0	0	black
4	2	8	orange
5	12	10	light green
6	9	4	dark blue
7	4	6	red

Page 69 append to table 12-2

Graphic Mode	Mode Type	Columns	Rows Split Screen	Rows Full Screen	Number of Colors	RAM Required (Bytes)
9	GRAPHICS	80	—	192	1	8122
10	GRAPHICS	80	—	192	9	8122
11	GRAPHICS	80	—	192	16	8122

Page 73 Table 12-4

Replace Table 12-4 with the following:

Default Colors	Mode or Condition	Set-color Register Addr	Poke Color	Description and Comments
Light blue	GRAPHICS 0	4	709	Register
Dark blue		6	710	number identifies
Black	TEXT MODE	8	712	character Border
Orange	GRAPHICS 1, 2	4	708	See table
Light green		5	709	Character
Dark blue		6	710	12-3 Character
Red		7	711	Character
Black	TEXT MODES	8	712	Background, border
Orange	GRAPHICS 3, 5, 7	4	708	1 Graphics point
Light green		5	709	2 Graphics point
Dark blue		6	710	3 Graphics point
Black	4-COLOR MODES	8	712	0 Background, border
Orange	GRAPHICS 4, 6	4	708	1 Graphics point
Black	2-COLOR MODES	8	712	0 Background, border
Light blue	GRAPHICS 8	5	709	1 Graphics point
Dark blue		6	710	2 Graphics point
Black	1 COLOR, 2 LUM.	8	712	0 Border
Gray	GRAPHICS 9			Register Number identifies
	1 HUE, 16 LUM.	8	712	point luminance
Black	GRAPHICS 10	0	704	0 Graphics point
Black	9-COLOR, 1 LUM.	1	705	1 Graphics point
Black		2	706	2 Graphics point
Black		3	707	3 Graphics point
Orange		4	708	4 Graphics point

Light Green		5	7095	Graphics point
Dark Blue		6	7106	Graphics point
Red		7	7117	Graphics point
Black		8	7128	Background, border
	GRAPHICS 11			
See Table 12-1	16 HUE, 1 LUM.	8	712	Register number identifies hue
				Point and background lum., background hue (should be 0)

Note graphics modes 9, 10, 11 require the GTIA chip instead of the CTIA chip for proper operation.

Page 86 insert at centimeter 18:

Mathematics of Music

A above middle C is standardized at a frequency of 440 Hz. Ideal tuning (or temperament) for other notes would yield a maximum number of consonant chords. Mathematically, no perfect tuning exists. Different compromises lead to different temperments. The most common temperament used now is equal temperament (all twelve notes equally spaced).

Using equal temperament, frequencies for notes can be approximated by the following. To be consistent with the Music Composer Cartridge, let the notes be numbered with C being 1, C# being 2, ..., and B being 12. Let the octaves be numbered so that octave 4 begins with middle C., octave 5 being the next higher octave. The formula below approximates the pitch values:

$$\text{INT}(.5+2(11-\text{OCTAVE-NOTE}/12))$$

The frequency for a given pitch value can be given by:

$$\begin{aligned} \text{FREQUENCY} &= 63921/(2x(\text{PITCH}+1)) \\ \text{or} \\ \text{FREQUENCY} &= 440x2 ((\text{NOTE}-58)/12+\text{OCTAVE}) \end{aligned}$$

Using the SOUND command, frequencies from 125 Hz to 32KHz can be played. However, because of the resolution of the frequencies, only the musical notes from C of octave 3 thru C of octave 6 can be played accurately enough to "sound right." However, by using POKE commands, higher resolution frequencies are available. This makes available the complete range of the piano keyboard. This is accomplished by combining two voices into one (reducing the total number of voices available). The following example illustrates this technique. It combines voices 1 with 2 and 3 with 4 to provide two high resolution voices.

```

10 DEF FH(F)=INT((1789790/(2*F)-7)/256
20 DEF FL(F)=INT((1789790/(2*F)-7)) AND
D 255
30 PRINT "Frequencies";:INPUT F1,F3
40 DISTORTION=10:VOLUME=8
50 POKE &D208,&78 ! merge channels 1,2
and 3,4; use 1.79 MHZ clock
60 POKE &D203,0:POKE &D207,0 ! turn off

```

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```

f sound before changing freq. to prevent warbling
70 POKE &D200,FL(F1):POKE &D202,FH(F1)
! set channel 1,2 frequency
80 POKE &D204,FL(F3):POKE &D206,FH(F3)
! set channel 3,4 frequency
90 POKE &D203,DISTORTION*16+VOLUME ! turn on channel 1,2
100 POKE &D207,DISTORTION*16+VOLUME ! turn on channel 3,4
110 GOTO 30

```

Page 111 insert at centimeter 15:

For the COLORn registers, the high order 4 bits give the hue, the low order 4 bits (with bit 0 ignored) give the luminance.

Page 116 insert at centimeter 12:

The bits in CHACT control the display of "inverse" characters as below:

Bit	Value	Result
0	off	display "inverse" character as character
0	on	display "inverse" character as blank
1	off	display "inverse" as non-inverse
1	on	display "inverse" as inverse
2	off	display all characters right-side-up
2	on	display all characters with vertical reflection

Page 117 insert at centimeter 6:

POKE 0 is SDMCTL to disable ANTIC, POKE 34 to enable.

Page 121 insert at centimeter 5:

SKSTAT AND 8 = 0 if the SHIFT is depressed, SKSTAT AND 4 = 0 if the last key is still depressed.

Page 143 insert at centimeter 9:

AND can also be used as a bitwise AND operator.

Page 147 change at centimeter 5:

Example: NAME "D:SUB1" TO "SUB2"

Page 147 insert at centimeter 9:

NOT can also be used as a bitwise complement operator.

Page 147 change at centimeter 19:

Example: OPEN #1, "D:INVEN.DAT" OUTPUT

Page 148 insert at centimeter 4:

OR can also be used as a bitwise OR operator.

Page 150 change at centimeter 2:

Example: PRINT SPC(5);A\$

Page 150 change at centimeter 13:

Example: PRINT TAB(20);A\$

Page 157 change at centimeter 14:

GET #1,D
POKE ADDR+I,D:NEXT I

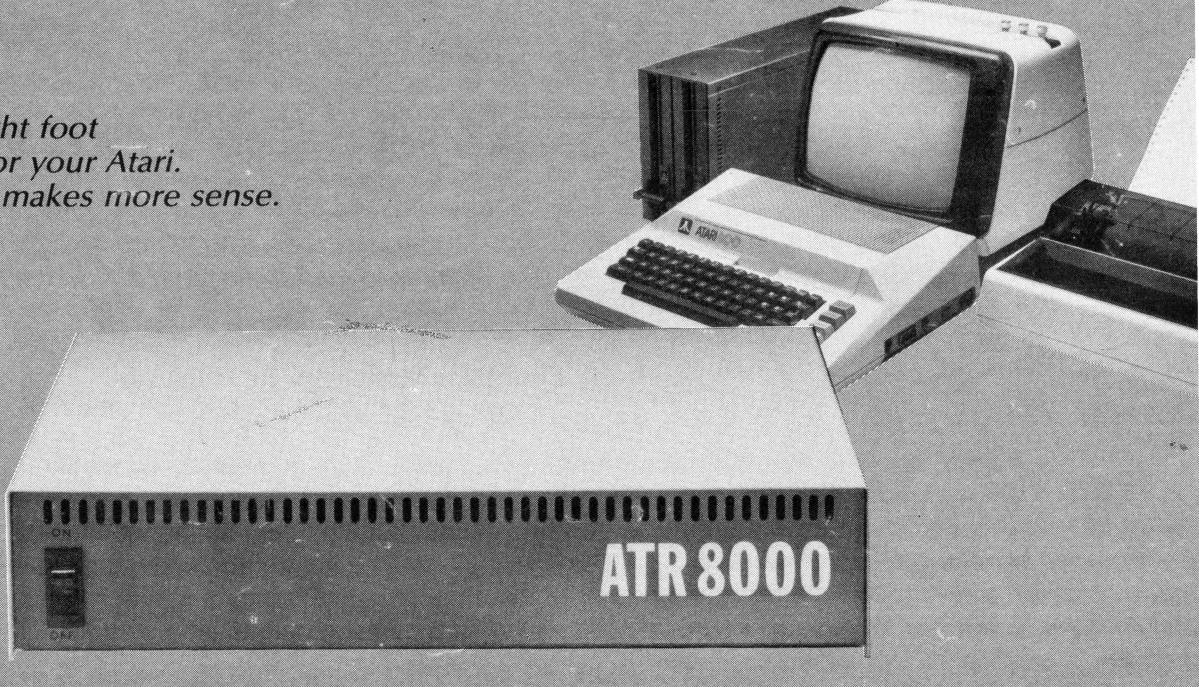
Page 159 change the indicated lines:

```

170 FOR I=0 TO 159
370 CIO%(5)=0:CIO%(6)=0
470 GET #2,D:IF D 10 THEN PRINT CHR$(D);

```

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FROM RAGS TO RICHES

A Home Financial Management Program

48K disk

by Bob Curtin

I'll never forget the look on my wife's face the day I announced I was buying a computer for the house. Her eyes narrowed to suspicious slits, her jaw firmly set, and her lips drew into a thin tight line.

"No, really, honey," I soothed, "It'll be good for the kids! I can use it for word processing! You can do biorhythms and stuff! And it'll do the family finances!"

Well, a year later we are indeed using our ATARI for home finances, and I'm not exaggerating when I declare that the impact has been phenomenal. I'd long been a sloppy money manager, prone to paying the bills in response to a late notice, or worse. We never kept records of purchases and our filing system consisted of various drawers and boxes scattered around the house.

The checking accounts were always a disaster. We were getting shell shocked from the sound of ricocheting checks, and the accompanying service charges were costing us a small fortune.

The day came when we decided to get organized; to put things right; and to use our ATARI to help us do it. We ordered a computer printout of all of our accounts from our bank, bought a filing cabinet and set up a simple filing system, and then ran into a stone wall. Finding the financial management software for our ATARI proved to be a job unto itself. Nothing fit. Either the programs were too simple, too comprehensive (I mean, who needs custom checks printed?) or much too expensive.

After months of searching, I happened across a program entitled FAMILY CASH FLOW, written by Jerry Falkenhan. This excellent program is available through the ATARI Program Exchange for under twenty-five dollars and is a steal at that price.

We immediately incorporated FAMILY CASH FLOW (FCF) into our money management system, and though it proved invaluable in recording our expenditures and income in infinite detail, and in giving us a general overview of our finances for the year, it did have some shortcomings. For instance, it didn't provide the means for setting up and maintaining a weekly budget. It also didn't keep track of

checking accounts, savings accounts, or cash on hand. I decided to write the missing parts myself, and what follows is not only the program listing and documentation, but a description of the home finance system which evolved from the use of this program and FAMILY CASH FLOW together.

Those of you out there who've not yet started using your computer for home finance management are in for a shock when you discover the difference it makes. My wife no longer glares at our ATARI with naked hatred. She doesn't love it yet, but she does treat it with a grudging respect.

The bills are now paid on time. The checking accounts are not just balanced at the end of the month; they are ALWAYS balanced. We can, in a matter of seconds, find out how much we paid for clothes last December, and even break it down to cost per individual! I can tell you how much I paid for any given item, in any given month, when the purchase was made, and the check number, all in under one minute.

As I said, there's been a phenomenal change in our home finances, and we owe it all to our ATARI.

Program Description

When I sat down to block out this budget program, there were two things I firmly fixed in my mind. First, I wanted to make the program as simple to use as possible, and also as safe and crashproof as possible. Second, although this program was written to be used in conjunction with FCF, it can also be used alone to maintain a weekly budget.

Unfortunately, I had to compromise some program speed in favor of a number of measures designed to keep the user from accidentally overwriting or wiping out data files. Data will automatically be entered and filed when accessing the budget modes and the checking account mode. Further, although you can change the week number from either budget mode, you can't change the month without returning to the main menu. This was done because the data files are named after months, and when the month changes, so does the data file name. If you were allowed to change the month, it'd be possible to

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enter the data for one month, change the data file name, and then file the data from this previous month into the new file, thus destroying any data already in that file. I think the time spent waiting for automatic loading and filing of data is a small price to pay to guarantee the safety of the data itself.

All commands which alter or purge the data are two-step commands so that accidental file destructs are kept to a minimum.

Program features include up to thirty budget categories, twenty-five of which are user definable. All columns are right justified and have trailing zeros.

The checking account routine allows you to keep track of up to three checking accounts. It can also be used to keep track of savings accounts, slush funds, cash-on-hand, loan balances, or anything you'd like to keep a running tally on. When checks are written against an account, the amount is automatically deducted from the account balance, and the amount of the check and the check number is stored in memory. A running total of the outstanding checks is constantly displayed in the checking account mode, and a listing of all outstanding checks can be gotten on command. This listing includes the amount of each check and the check numbers.

A payment routine keeps track of the total

payments made in each category, and a listing of these payments can also be gotten on command.

There are several other features or functions listed on the main menu which are supportive of the features I've just mentioned. I've made every attempt to anticipate data entry which would cause errors and have provided routines prevent the program from crashing.

Getting Started

After typing in the code, the first thing that must be done is to create a data file. To do this, simply run the program. When the main menu appears, press "C" (change date). This mode allows inputs of numeric values 1 to 5 and alpha inputs A to L. The numeric values represent week numbers and the alpha inputs correspond to the months shown on the display. Press the letter corresponding to the month for which you want to create a data file. The program will return to the menu. Type "F" (file data). The program will remind you that you forgot to enter a week number and will enter the date change mode again; enter any number between 1 and 5. When the main menu reappears, a data file has been created for the month you chose.

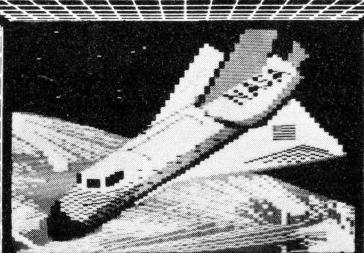
Next, using the table of commands, run all the functions and subroutines in the program to be sure

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you've done your typing correctly. If you run into problems use the program outline to locate the respective block of code, and go over it to find your mistake. Once you've gotten the program up and running, the next stop is to define your categories.

Defining Categories

This step is one which requires some thought.

First of all, make a list of all of your expenses; all of them, no matter how petty. List them in any order. Now add to the list any expenses which seasonal, such as heating fuel or motorcycle insurance. Next, delete all occasional or one-time expenses, unless you plan on budgeting for such expenses over a period of time.

Once you've got a complete list of all of your regular expenses, combine like items, such as the premiums on two separate auto insurance policies, or the payments on more than one auto loan, and then give the category a label of fourteen letters or less. Label the rest of your expenses the same way.

Next, these categories have to be divided into two separate groups, labelled "fixed expenses" and "variable expenses." Please bear in mind that the term "fixed" does not mean that the amounts in the individual categories in this group do not vary; most of them probably will. What it does mean is that

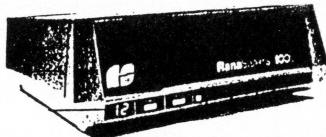
expenses in this group must be paid or the service, or commodity, or whatever will stop or be withdrawn. For example, electricity is a fixed expense. Even though the amount of the bill may vary from month to month, if the bill is not paid, the electricity will be shut off. Other examples of fixed expenses are insurance policies, rent or mortgage payments, loan payments, television cable, telephone, medical insurance, etc.

On the other hand, "variable expenses" are those which you have direct control over. You may buy the item this week or not, or you may buy more or less of it, or you may put off buying it until next week, as you see fit. You're not locked in to a set payment or rate. These payments or expenses may be varied or eliminated each week to accomodate the fixed expenses. Note that the reverse is not true. You budget your fixed expenses and then you budget your variable expenses with what's left over.

Examples of variable expenses include gasoline/oil, recreation, food and clothing.

Once you've divided your categories into the two groups, press "E" (define categories) and type the labels you've given each category into their respective groups. I suggest filling up all unused spaces in a label, and also all unused categories with dashes. It'll

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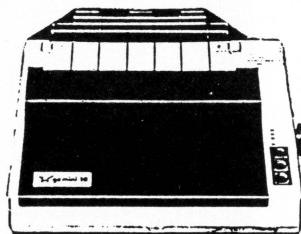
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make the display neater and easier to read.

When you've typed in all of your labels, repeat the file creation procedure outlined previously to store it on disk.

Now you're set to enter data.

The System

This is probably a good place to take a general overview of the budget program (BP) and how it relates to FCF. Also remember that nothing here is etched in stone, so if you feel uncomfortable with any part of the system, by all means change it to suit your needs.

In general, BP and FAMILY CASH FLOW are two sides of the same coin. FCF is used to document that which BP projects. BP allocates the funds to the different categories, and FCF documents the individual expenditures in each category. FCF also provides detailed documentation of income, and compares income to expenses on a monthly and yearly level.

The crux of the budget program is, logically, the two budget displays. The three columns (labelled "(#)", "TOT", and "VAR") represent, respectively, the weekly budget in each category, the total of all money budgeted for the month in each category, and the total variance in each category. The variance can be defined as the difference between the total money budgeted in a category, and the total payments made in a category. It's quite possible for the variance to become a minus number.

RUN the program and enter the month you created the data file for. Then press "A" (budget — fixed). The computer will remind you that you haven't entered a week number and will send you into the "change data" mode. Enter 1 for the week number. The computer will automatically load the category names which you defined earlier and print the fixed expense display on the screen.

The first column contains the amount budgeted for each category in the week enclosed in parentheses at the top of the column. To enter figures in this column, simply press the letter beside the category you want and enter the amount you want to budget. The computer will then be ready for another input.

Note that the screen display will not update itself automatically. Since the screen takes about eight seconds to print (due to the right justifying and trailing zeros subroutines) entering a lot of data would be a lengthy process if the screen reprinted itself after every input. Therefore, I made the screen update a command unto itself. Just press zero.

To illustrate how the budget display works, let's enter some data. Enter 10, 50 in category A, and update the display. Notice that 10, 50 is displayed in each column opposite category A.

Change the week number (press Q to get to the change date mode) and you'll see that column one is now empty, but column two and three have re-

mained the same. This is as it should be since you haven't entered anything for the second week yet.

Now enter 10,00 in category A again and update the display. The first column will read 10,00 and the second and third will read 20,50. The second column reflects the total of all money budgeted in a category by adding all of the weeks together. The third column (variance) is the monthly total less the total payments made in each category. The variance is a useful tool in maintaining your budget from month to month.

If you change the week number back to one, you can see that the original amount budgeted for that week is still in place, but the total and variance reflect weeks one and two together.

Let's make a payment. This is done in exactly the same way as entering figures in column one, except that the data is put in the form of a minus figure. For instance, if you wanted to make a \$50 payment in category F, you'd simply press "F" and enter -50. The computer will come right back and display what you entered and ask if it's correct. If it is, type "Y." If it isn't, type "N" (and re-enter the payment).

Make a \$20 payment in category A and update the display. Column one still contains the weekly budget, column two still holds the monthly total, but column three now reads .50, or the monthly total less the total payments.

If you press "S" you'll be rewarded with a listing of the total payments made in each category. Notice that there's a 20.00 payment listed in category A. If you were to make another payment in category A, the new payment would be added to reflect a total for the month. (Individual payments are documented in FCF, while BP is only concerned with the totals in each category.)

As you can see from the format, the BP is used to allocate your money to the different categories each week, keep a running total for the month, and tell you through the variance whether you've over- or under-budgeted for the month and by how much.

The variance is carried over into the next month so that you can adjust for it. It's important to note, however, that the carried-over variance will not affect any data entered. In other words, starting the month with a minus variance in a given category will not lessen the variance caused by new data input. On the contrary, once new data is entered in a category, any carried-over variance will be wiped from memory in that particular category.

Turning now to the checking account routine, you can see that there are the balances and totals of checks outstanding for three accounts. The commands in this mode are pretty much self-explanatory, but there are a few things that you should know.

First, each account will handle a total of forty-five outstanding checks at any given time. This is sufficient for most people, but if you find yourself

writing more than forty-five checks a month in a particular checking account, you can borrow the check handling capacity of one of the unused accounts and handle the balance manually through the deposit and withdrawal commands.

One of the most useful parts of this program is the outstanding checks listing. It's a simple matter to balance your checkbook each month by deleting the outstanding checks each month when the bank returns them.

Words of Caution

With the three columns and the category labels, the display is a bit crowded. I must warn you that the program will crash if any value greater than 9999.99 runs through the right justification subroutine, and printed to the screen. It was a matter of room more than anything else, and I reasoned that anyone with a budget of \$10,000 a month would have absolutely no reason to use this program anyway.

When you're ready to create a file for a new month, simply load the data from the previous month by pressing "G" (get data). When the program returns to the menu, change the month to the new month, press "H" (clear data) and when the menu returns, press "F" (file data). The clear data command clears all of the variables except those containing the checking accounts, category definitions, and variances. This data will be retained and carried into the new month. **REMEMBER TO CHANGE THE MONTH BEFORE FILING THE PURGED FILE OR YOU'LL DESTROY THE CONTENTS OF THE OLD FILE.** This is worth repeating. To create a data file for a new month, you:

1. Press "C" (change date) and set the month to the most recent file.
2. When you return to the menu, press "G" (get data) and load the contents of the most recent file. (This gives you the checking account balances, outstanding check list, and category labels.)
3. When you return to the menu, press "C" again and change the month to what you want to create the new file for. **THIS IS VERY IMPORTANT!**
4. When you return to the menu, press "H" (clear data.)
5. When you return to the menu, press "F" (file data.) When you return to the menu, a new data file will have been created containing the checking account balances, outstanding check lists, category names, and variances.

Though it's really not necessary to save old files, I suggest keeping six months of old files at any given time. Then, when a new file is created, delete the file which is then seven months old. Even though all of your expenditures are recorded in infinite detail in FCF, reviewing the monthly variances from time to time will tell whether you're chronically over or under budgeting in a certain category.

Always be sure to keep back-up copies of your data files.

Hints, Suggestions, and Putting It All Together

This is sort of a potpourri of informational tidbits which might help you to keep your budget running smoothly after you've gotten it set up. Some of it may sound patently obvious, even to the most casual observer, but I include it for those of you out there who are anywhere near as inept with money as I, if that's possible.

First of all, before you can effectively plan ahead, you have to know where you **are**. Set up some sort of filing system to keep all of your bills, receipts, warranties, insurance policies, legal documents, medical records, recent bank statements, deposit slips, business letters, tax forms and records, school records, and so on, in a single, easily accessible place. Keep old bills only until you've actually been credited for the last payment on a new bill; then throw the old bill away. Do your filing every day; don't let it build up to a job that takes more than minutes at a time.

Records are extremely important in the scheme of financial affairs, so pay as many bills as possible with checks. If you make accurate and copious notations on each check as to exactly what the money is being spent for, you'll have little problems from your end of a lawsuit or an IRS audit. Find yourself a bank that gives out free checking (or even better, pays interest on your checking account) and then take full advantage of it.

Whenever you send out a check, be sure to make a notation in your checkbook of the **mailing date**, not just the date the check was written.

As I've mentioned previously, the FAMILY CASH FLOW program is used in this financial management system mainly to document expenditures. It's very good at this, allowing up to 125 individual entries per month (250 individual entries if you have two disk drives) in thirteen categories. Each entry documents the date, the amount of the payment, and allows a description of the payment up to 15 characters long. This description is useful for a number of things, such as recording the check numbers along with the company the check was sent to. For instance, ELECTRIC (623). You can record where you've made cash purchases by including the name or initials of the store in the description. An example of this is: SHOES(KINNEY).

If you have credit cards, you can indicate the purchases made with them much the same way, i.e. DISKS(VISA). Incidentally, you should keep files for each credit card in your filing system to hold the receipts and monthly statements. When you make your monthly payments, you'll have a someplace to file the check number and date, other than your computer. It always pays to keep a hard copy.

Never mail a check that isn't covered by funds in your checking account. You can make the check out

ahead of time. You can enter it into your computer. You can even put the stamp on the envelope. But don't mail it until the money's actually in the account. Ol' Murphy just lays in wait for folks who make a habit of that, and it'll end up costing you in service charges.

Make savings one of your fixed expense categories. Pay yourself first, then pay your bills. I know you've heard it before, but pick a percentage, no matter how small, and skim that right off the top. Stick it into a savings account and forget it. Once you get into that habit, you can increase the percentage, and watch your dough grow!

Use the variances; they're great for tagging unwanted trends. If you notice categories which you have to constantly increase week after week, then go to the FAMILY CASH FLOW program and review the expenditures. For instance, if you see a trend toward an increase in gasoline usage, you may need a tune-up on the bomb.

FCF, if used properly, can show you some surprising things about your buying habits. Be absolutely ruthless in documenting expenditures, even if you're not too thrilled about being reminded of them. I'm definitely an impulse buyer, but after getting into the habit of telling my ATARI what I'd spent my money on that day, and then being ashamed of myself when the figures glared back at me when looking at it the next day, I tend to think more now before reaching for my wallet. Be honest. Don't bury embarrassing purchases. As a matter of fact, if you have any money-gulping bad habits like smoking or drinking, being reminded of the cold, hard cash going down the drain day after day can be an added incentive to moderate or abstain.

Now down to the nitty gritty. Just how do you use these numbers?

Well, first of all, you have to have some method of defining the weeks in a month. Most months on the calendar have at least one week which overlaps from one month to the next, that is, part of the week will begin in one month and then end in another month. This isn't a problem with a monthly budget, but with a weekly budget, unless you can automatically signify which month a particular week belongs in, the budget could get confusing, to say the least. The method for doing this has to be simple and consistent from month to month.

One method is to pick a day of the week to trigger the start of a new week. It really doesn't matter which day you choose, as long as it remains the same every week and month to month. The day you choose will determine the number of weeks in a month (either four or five) and will trigger the start of a new week. For instance, suppose you chose Wednesday as your "trigger" day. In August of 1983 there are five Wednesdays (the 3rd, 10th, 17th, 24th, and 31st). Therefore, there are five weeks in August. The first day of the month is Wednesday, August 3rd, and the

last day of the month is Tuesday, September 6th. Note that August 1st and 2nd were included in the last week of July.

Of course, you may devise any method you want. Just be sure your method assigns each and every week of the year to a specific month and to no other.

That done, the next thing to do is to go back to your filing system.

Remember that the reason for setting up a budget in the first place is to separate your income into little piles according to the categories which you defined earlier. It wouldn't do to separate the money in name only, so the thing to do now is to provide a place to store the budgeted cash until it's needed. Get yourself some medium-sized coin envelopes and label one envelope for each category in the Budget Program which you pay in cash. Those categories which you pay by check obviously don't need envelopes because the cash is deposited in your checking account(s). Next, label file folders to match the envelopes. Some of the envelopes can be doubled up in file folders if they're similar. Just be sure to mark the folder with both labels. Now, when you budget a certain amount for a category, physically place the cash into the appropriate envelope.

Let's say you budgeted \$65.00 in a given week for food, but spent only \$56.50 at the market. The last column in your budget Program will show a variance of \$8.50, and you should indeed put the remaining \$8.50 back into the envelope to keep the computer honest. When it becomes time to budget for the next week, you may use the extra cash to augment your food budget. For instance, if you decided to stick to the \$65.00 figure for food the next week, you need actually only put \$56.50 down as the budgeted figure for that week, but the variance will go to \$65.00 and will reflect what's actually the cash total in the envelope.

A word of advice. It's not really a good idea to over-budget on a consistent basis and built up considerable amounts in your envelopes. It's a far better idea to take that extra cash and stuff it into a savings account or an IRA and earn interest on it. Try to budget exactly what you need and no more. Put \$30 to \$50 into your MISCELLANEOUS envelope to act as a buffer against minus variances.

Speaking of minus variances, be sure to mark on the outside of the MISCELLANEOUS envelope the category which "borrowed" the cash, and of course, the amount borrowed. Make the same notation on the category envelope. The next week, all minus variances should be paid back to MISCELLANEOUS file before any money is budgeted. For the sake of clarity, let's assume that in our FOOD category, we had a -8.50 variance left over from last week. If we wanted to maintain our \$65.00 level, we'd have to budget \$73.50, \$8.50 would be put into the MISCELLANEOUS file, and \$65.00 would be put into the FOOD file. Note that by entering

73.50 into the first column, the variance would automatically reflect the \$65.00 which was truly budgeted. The monthly total will reflect any money which was budgeted to replace a minus variance.

You must remember that even though the variances are carried over into the next month, they have no effect on data entered for the new month. In fact, the old variances will be wiped from memory and replaced with updated variances in the new month.

Lastly, a word about the totals. The two totals under each column are the subtotal for the individual displays (on top) and the grand totals of the two displays together (on the bottom). The grand total under column one should never exceed your weekly income. (Easier said than done!) The grand total under column two should never exceed your monthly income. The grand total under column three, when at the end of a month, should never go below zero. (This assumes some sort of buffer in the MISCELLANEOUS file.)

Carry On

Well, there you have it: the bare bones for a system to keep close tabs on your money, document your expenditures, and budget weeks into the future. Mold it to fit your own particular needs, add whatever niceties you want, but I strongly suggest that you give your computer a chance to strut its stuff in something other than videogames. Either with this system or another, you'll be shocked out of your socks when you discover the speed, accuracy, and ease with which you can handle the household finances. To top it all off, paying the bills almost becomes fun! □

PROGRAM OUTLINE

1 — 25	Initialization
1000 — 1076	Date and Data File Name Routine
1500	Overall Tools
3000 — 3018	Fixed Expense Payments
3019 — 3040	Variable Expense Payments
4000 — 4115	Payment Verification
5000 — 5050	Checking Account Display
5500 — 5520	Checking Account Menu
5600 — 5620	Deposit Routine
5700 — 5720	Check Writing Routine
5800 — 5805	Withdrawal Routine
5900 — 5970	Outstanding Checks Routine
6002 — 6004	Date Reminder Routine
6005 — 6150	Fixed Expense Budget Display
6500 — 6525	Category Input
6530 — 6545	Amount Input
6600 — 6694	Variable Expense Budget Display
6700 — 6720	Category Input
6725 — 6740	Amount Input
7000 — 7416	Define Categories

8000 — 8010	Right Justification Routine
8100 — 8103	Initialization of Temporary String
8200 — 8205	Trailing Zeros Routine
9000 — 9099	Main Menu
9500 — 9550	Error Handling Routine
10000 — 10020	Save Data
10200 — 10299	Retrieve Data

COMMAND TABLE

MODE	COMMAND	RESULT
A BUDGET - FIXED or BUDGET - VARIABLE	A - O P	Category for Input Return to Main Menu
	Q	Change Date
	R	Go to Fixed/Variable Expense Display
	S	List Payments
	0 (zero)	Update Display
* * * * *		
C CHANGE DATE	1 - 5 A - L	Week Number Month
* * * * *		
D	1	Deposit
CHECKING	2	Write Check
ACCOUNTS	3	Withdrawal
	4	List Outstanding Checks (accounts number)
		Delete Outstanding Checks ('Y' then the check number)
	5	Return To Main Menu
* * * * *		
E DEFINE CATEGORIES	4 - 30 1 - 3/15-16	Category to Define Return To Main Menu

```

1 YR=83
5 TRAP 9500
10 DIM TPS(15),NS(15),BL$(40),EX(45,10)
11 ,CH(3,3),MONS(15),PAY(45),IN(5,8),AS(15),
12 ,BS(15),CS(15),DS(15),ES(15),FS(15),
13 DIM GS(15),HS(15),IS(15),JS(15),KS(15),
14 ,LS(15),MS(15),NI$(15),OS(15),PS(15),
15 ),QS(15),RS(15),SS(15),TS(15),US(15)
16 DIM VS(15),WS(15),XS(15),YS(15),ZS(15),
17 ,AZ$(12),YRS(2),EOS(2),CK(3,45),CK1(3,45),
18 ,AT$(12),MON1$(15)
20 BL$(1)="":BL$(40)=BL$":BL$(2)=BL$":D=D
D=2
25 YRS=STR$(YR):GOTO 8999
1000 POKE 710,12:POKE 712,12:POKE 709,
0:?"K":POKE 752,1:POSITION 6,3:?"***"
*****"*****"*****"*****"*****"*****"
1005 POSITION 6,4:?"*":POSITION 33,4:
? " *":POSITION 6,5:?"* A JANUARY G
JULY   "
1010 POSITION 6,6:?"*":POSITION 33,6:
? " *":POSITION 6,7:?"* B FEBRUARY H
AUGUST "
1015 POSITION 6,8:?"*":POSITION 33,8:
? " *":POSITION 6,9:?"* C MARCH I
SEPTEMBER "
1020 POSITION 6,10:?"*":POSITION 33,10
0:?"*":POSITION 6,11:?"* D APRIL
J OCTOBER "

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1025 POSITION 6,12:? "E":POSITION 33,1
2:? "E":POSITION 6,13:? "E E MAY
K NOVEMBER *"
1030 POSITION 6,14:? "E":POSITION 33,1
4:? "E":POSITION 6,15:? "E F JUNE
L DECEMBER *"
1035 POSITION 6,16:? "E":POSITION 33,1
6:? "E":POSITION 6,17:? "*****"
*****"
1040 POSITION 7,20:? "ENTER MONTH OR W
EEK NUMBER":OPEN #1,4,0,"K":GET #1,I:
CLOSE #1:POKE 53774,112
1042 IF I>48 THEN IF I<54 THEN M=I-48:
RETURN
1044 IF I<65 OR I>76 THEN FOR E=1 TO 1
0:PSOUND 0,30,10,10:FOR J=1 TO 2
1045 IF I<65 OR I>76 THEN NEXT J:PSOUND
0,10,10,10:FOR J=1 TO 2:NEXT J:NEXT E
:PSOUND 0,0,0,0:GOTO 1040
1050 GOTO I+1000
1065 MON$="JANUARY":AZ$="D:JAN.":G
OTO 1100
1066 MON$="FEBRUARY":AZ$="D:FEB.":G
OTO 1100
1067 MON$="MARCH":AZ$="D:MAR.":G
OTO 1100
1068 MON$="APRIL":AZ$="D:APR.":G
OTO 1100
1069 MON$="MAY":AZ$="D:MAY.":G
OTO 1100
1070 MON$="JUNE":AZ$="D:JUN.":G
OTO 1100
1071 MON$="JULY":AZ$="D:JUL.":G
OTO 1100
1072 MON$="AUGUST":AZ$="D:AUG.":G
OTO 1100
1073 MON$="SEPTEMBER":AZ$="D:SEP.":G
OTO 1100
1074 MON$="OCTOBER":AZ$="D:OCT.":G
OTO 1100
1075 MON$="NOVEMBER":AZ$="D:NOV.":G
OTO 1100
1076 MON$="DECEMBER":AZ$="D:DEC.":G
OTO 1100
1100 RETURN
1500 TOT5=0:TOT6=0:AV2=0:FOR E=1 TO 30
:TOT5=TOT5+EX(E,W):TOT6=TOT6+EX(E,6):A
V2=AV2+EX(E,8):NEXT E:RETURN
3000 ? "R";? "-----" FIXED EXPENSE PAYM
ENTS":? "-----";? "RENT/MORTGAGE--"
3005 ? "ELECTRIC-----";? "TELEPHONE-
---"
3010 ? A$:? B$:? C$:? D$:? E$:? F$:? G
$:? H$:? I$:? J$:? K$:? L$
3015 N$=8:FOR E=1 TO 15:POSITION 19,E+
3:TP$=STR$(EX(E,0)):GOSUB 8000:?
N$(1,
N$):NEXT E
3018 OPEN #1,4,0,"K":GET #1,I:CLOSE #
1:IF I>0 THEN RETURN
3019 ? "R"
3020 ? "----- VARIABLE EXPENSE PAYMENTS
-----";? "FOOD-----";? "CLOT
HING-----"
3025 ? M$:? N$:? O$:? P$:? Q$:? R$:?
S$:? T$:? U$:? V$:? W$:? X$:? Y$
3030 N$=8:FOR E=16 TO 30:POSITION 19,E-
12:TP$=STR$(EX(E,0)):GOSUB 8000:?
N$(1,
N$):NEXT E
3040 OPEN #1,4,0,"K":GET #1,I:CLOSE #
1:IF I>0 THEN RETURN
4000 POSITION 0,22:? "IS THIS PAYMENT
CORRECT? CAT=";CHR$(CA+64);";J:OPEN
#1,4,0,"K":GET #1,I:CLOSE #1
4005 IF I=89 THEN RETURN
4010 IF I=78 THEN POP :GOTO 6545
4015 GOTO 4000
4100 POSITION 0,22:? "IS THIS PAYMENT
CORRECT? CAT=";CHR$(CA+49);";J:OPEN
#1,4,0,"K":GET #1,I:CLOSE #1
4105 IF I=89 THEN RETURN
4110 IF I=78 THEN POP :GOTO 6740
4115 GOTO 4100
5000 POKE 82,0:POKE 710,12:POKE 712,12
:POKE 709,0!?"R";? "----- CHECK
ING ACCOUNTS-----"
5005 POSITION 0,3:? "ACCOUNT NO.
1 2 3 "

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```

5010 POSITION 0,4:? "
5015 POSITION 0,5:? "BALANCES":POSITION
I 13,5:CA=0:E=0:GOSUB 8101:GOSUB 8000:
? NS$(1,N5)
5020 POSITION 22,5:CA=0:E=1:GOSUB 8101
:GOSUB 8000:? NS$(1,N5):POSITION 31,5:C
A=0:E=2:GOSUB 8101:GOSUB 8000
5025 ? NS$(1,N5)
5030 POSITION 0,7:? "TOTAL OF":? "THE
CHECKS":? "OUTSTANDING"
5035 T01=0:FOR E=1 TO 45:T01=T01+CK1(1
,E):NEXT E:POSITION 13,9:TP$=STR$(T01)
:GOSUB 8000:? NS$(1,N5)
5040 T02=0:FOR E=1 TO 45:T02=T02+CK1(1
,E):NEXT E:POSITION 22,9:TP$=STR$(T02)
:GOSUB 8000:? NS$(1,N5)
5045 T03=0:FOR E=1 TO 45:T03=T03+CK1(2
,E):NEXT E:POSITION 31,9:TP$=STR$(T03)
:GOSUB 8000:? NS$(1,N5)
5050 POSITION 0,12:? "
5055 POSITION 0,14:? "1 DEPOSIT":POSIT
ION 0,15:? "2 WRITE CHECK":POSITION 0,
16:? "3 WITHDRAWAL"
5060 POSITION 0,17:? "4 LIST OUTSTANDI
NG CHECKS":POSITION 0,18:? "5 RETURN T
O MENU"
5065 POKE 53774,112:POSITION 0,20:? "C
ATEGORY":;OPEN #1,4,0,"K":;GET #1,CA:
CLOSE #1:POKE 53774,112
5070 IF CA<49 OR CA>53 THEN 5505
5510 ON CA-48 GOTO 5600,5700,5800,5900
,5520
5515 GOTO 5505
5520 ? "K":POSITION 0,12:? " "
5525 ? "ENTER DATA --- PLEASE WAIT" ":"GOSUB 1
0000:GOTO 9000
5600 POSITION 0,20:? "ACCOUNT NUMBER":;
OPEN #1,4,0,"K":;GET #1,CA:CLOSE #1:I
F CA<49 OR CA>51 THEN 5600
5602 POKE 53774,112
5605 ? "+":;INPUT J ":"? "+DEP
05IT":;INPUT J
5610 CH(0,CA-49)=CH(0,CA-49)+J
5620 GOTO 5600
5700 POSITION 0,20:? "ACCOUNT NUMBER":;
OPEN #1,4,0,"K":;GET #1,CA:CLOSE #1:I
F CA<49 OR CA>51 THEN 5700
5702 POKE 53774,112
5705 ? "+AMOUNT OF CHECK":;INPUT J:"?
"+":;INPUT NU
5707 POKE 53774,112:TP$=STR$(NU):IF LE
N(TP$)<3 THEN ? "+CHECK NUMBER MUST BE
>THREE SPACES":;FOR E=1 TO 400:NEXT E
5708 IF LEN(TP$)<3 THEN ? "+"
5710 :GOTO 5705
5715 CA=CA-49:FOR E=1 TO 45:IF CK(CA,E
)=0 THEN CK(CA,E)=NU:CK1(CA,E)=J:GOTO
5720
5715 NEXT E
5720 CH(0,CA)=CH(0,CA)-J:GOTO 5000
5800 POSITION 0,20:? "ACCOUNT NUMBER":;
OPEN #1,4,0,"K":;GET #1,CA:CLOSE #1:C
A=CA-49:IF CA<0 OR CA>2 THEN 5800
5802 POKE 53774,112
5805 ? "+":;INPUT J:CH(0,CA)=CH(0,CA)-J:G
OTO 5000
5900 ? "K":POSITION 0,0:? "
5905 ? "? ACCOUNT NUMBER":;OPEN #1,4
,0,"K":;GET #1,CA:CLOSE #1:CA=CA-49:IF
CA<0 OR CA>2 THEN 5905
5906 POKE 53774,112
5907 GOTO 5970
5910 POSITION 0,0:FOR E=1 TO 45
5920 IF CK(CA,E)>0 THEN TP$=STR$(CK1(
CA,E)):GOSUB 8000:? CK(CA,E);"$";NS$(1,N5);
5925 IF PEEK(84)=19 THEN POKE 84,20
5930 NEXT E
5940 POSITION 0,19:? "DELETE OUTSTANDI
NG CHECKS":;OPEN #1,4,0,"K":;GET #1,J:
CLOSE #1:IF J=78 THEN 5000
5945 IF J=89 THEN 5950

```



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```

5947 GOTO 5940
5950 ? "4"
? "CHECK NUMBER";:INPUT J
5955 FOR E=1 TO 45
5960 IF CK((CA,E)=J THEN CK((CA,E)=0:CK1
((CA,E)=0
5965 NEXT E
5970 FOR E=0 TO 23:POSITION 0,E:?" "
NEXT E:GOTO 5910
5999 OPEN #1,4,0,"K":GET #1,J:CLOSE #
1:IF J>0 THEN 9000
6002 IF MON$="" THEN ? "K":POSITION 6,
12:? "YOU FORGOT TO ENTER A MONTH":FOR
E=1 TO 200:NEXT E:GOTO 1000
6003 IF W=0 THEN ? "K":POSITION 3,12??
"YOU FORGOT TO ENTER A WEEK NUMBER":F
OR E=1 TO 200:NEXT E:GOTO 1000
6004 RETURN
6005 GOSUB 6002:GOSUB 6002:POKE 82,0
6006 POKE 710,12:POKE 712,12:POKE 709,
0:? "K":POKE 559,34:POSITION 0,0:? MON
$:"BUDGET - FIXED EXPENSES""
6007 POSITION 20,1??"(";W,") TOT
VAR":E=1??"A RENT/MORTGAGE":GOSUB
8200
6010 ? "B ELECTRIC----":GOSUB 8200
6015 ? "C TELEPHONE----":GOSUB 8200
6020 ? "D ";AS:GOSUB 8200
6025 ? "E ";BS:GOSUB 8200
6030 ? "F ";CS:GOSUB 8200
6040 ? "G ";DS:GOSUB 8200
6050 ? "H ";ES:GOSUB 8200
6060 ? "I ";FS:GOSUB 8200
6070 ? "J ";GS:GOSUB 8200
6080 ? "K ";HS:GOSUB 8200
6090 ? "L ";IS:GOSUB 8200
6100 ? "M ";JS:GOSUB 8200
6110 ? "N ";KS:GOSUB 8200
6111 ? "O ";LS:GOSUB 8200
6122 TOT1=0:FOR E=1 TO 15:TOT1=TOT1+EX
(E,W):NEXT E:TP$=STR$(TOT1):POSITION 1
6,18:GOSUB 8000?:NS(1,NS)
6123 TOT2=0:FOR E=1 TO 15:TOT2=TOT2+EX
(E,6):NEXT E:TP$=STR$(TOT2):POSITION 2
4,18:GOSUB 8000?:NS(1,NS)
6125 ? "TOTALS":GOTO 6140
6140 AVG=0:FOR E=1 TO 15:AVG=AVG+EX(E,
8):NEXT E:TP$=STR$(AVG):POSITION 32,18
:GOSUB 8000?:NS(1,NS)
6145 POSITION 16,19:TP$=STR$(TOT5):GOS
UB 8000?:NS(1,NS)
6150 POSITION 24,19:TP$=STR$(TOT6):GOS
UB 8000?:NS(1,NS):POSITION 32,19:TP$=
STR$(AV2):GOSUB 8000?:NS(1,NS)
6500 POSITION 2,22??"CATEGORY?":OPEN
#1,4,0,"K":GET #1,J:CLOSE #1:IF J=48
THEN CA=1:GOSUB 1500:GOTO 6005
6501 CA=J-64:IF CA<1 OR CA>19 THEN POS
ITION 0,20??"P RETURN TO MENU 0 UPD
ATE DISPLAY"
6502 IF CA<1 OR CA>19 THEN POSITION 0,
21??"Q CHANGE DATE R VARIABLE EX
PENSES"
6503 IF CA<1 OR CA>19 THEN POSITION 0,
22??"S LIST PAYMENTS":FOR E=1 TO 400:
NEXT E:POSITION 0,20:GOTO 6507
6505 IF CA=16 THEN CA=1??"K":POSITION
0,12??"FILING DATA --- PLEASE
MAIN":GOSUB 10000:GOTO 9000
6506 GOTO 6515
6507 ? ":""
":GOTO 6545
6515 IF CA=17 THEN MON1$=MON$:AT$=AZ$:
GOSUB 1000:MON$=MON1$:AZ$=AT$:CA=1:GOS
UB 1500:GOTO 6005
6520 IF CA=18 THEN GOSUB 1500:GOTO 660
0
6525 IF CA=19 THEN GOSUB 3000:CA=1:GOT
0 6005
6530 POSITION 20,22??"AMOUNT":INPUT
J:TP$=STR$(J):IF LEN(TP$)>4 AND TP$(LE
N(TP$)-2,LEN(TP$)-2)<>".." THEN 6701
6535 IF J<0 THEN GOSUB 4000:EX(CA,8)=E
X(CA,8)+J:EX(CA,0)=EX(CA,0)+ABS(J):GOT
0 6545

```

```

6540 EX(CA,W)=J:EX(CA,6)=0:FOR E=1 TO
5:EX(CA,6)=EX(CA,6)+EX(CA,E):NEXT E:EX
((CA,8)=EX(CA,6)-EX(CA,0)
6545 POSITION 0,22??":GOTO 6500
6600 GOSUB 6002:GOSUB 6002
6602 POKE 82,0:POKE 710,28:POKE 712,28
:POKE 709,16??"K":MON$;"BUDGET - VAR
TABLE EXPENSES""
6605 POSITION 20,1??"(";W,") TOT
VAR":E=1??"A FOOD-----":GOSUB
8200
6610 ? "B CLOTHING----":GOSUB 8200
6615 ? "C ";MS:GOSUB 8200
6620 ? "D ";NS:GOSUB 8200
6625 ? "E ";OS:GOSUB 8200
6630 ? "F ";PS:GOSUB 8200
6635 ? "G ";QS:GOSUB 8200
6640 ? "H ";RS:GOSUB 8200
6645 ? "I ";SS:GOSUB 8200
6650 ? "J ";TS:GOSUB 8200
6655 ? "K ";US:GOSUB 8200
6660 ? "L ";VS:GOSUB 8200
6665 ? "M ";WS:GOSUB 8200
6670 ? "N ";XS:GOSUB 8200
6675 ? "O ";YS:GOSUB 8200
6680 POSITION 8,18??"TOTALS"
6685 TOT3=0:FOR E=16 TO 30:TOT3=TOT3+E
X(E,W):NEXT E:TP$=STR$(TOT3):POSITION
16,18:GOSUB 8000?:NS(1,NS)
6687 TOT4=0:FOR E=16 TO 30:TOT4=TOT4+E
X(E,6):NEXT E:TP$=STR$(TOT4):POSITION
24,18:GOSUB 8000?:NS(1,NS)
6690 AV1=0:FOR E=16 TO 30:AV1=AV1+EX(E
,8):NEXT E:TP$=STR$(AV1):POSITION 32,1
8:GOSUB 8000?:NS(1,NS)
6692 POSITION 16,19:TP$=STR$(TOT5):GOS
UB 8000?:NS(1,NS)
6694 POSITION 24,19:TP$=STR$(TOT6):GOS
UB 8000?:NS(1,NS):POSITION 32,19:TP$=
STR$(AV2):GOSUB 8000?:NS(1,NS)
6700 POSITION 2,22??"CATEGORY?":OPEN
#1,4,0,"K":GET #1,J:CLOSE #1:IF J=48
THEN CA=16:GOSUB 1500:GOTO 6600
6703 CA=J-49:IF CA<16 OR CA>34 THEN PO
SITION 0,20??"P RETURN TO MENU 0 UP
DATE DISPLAY"
6705 IF CA<16 OR CA>34 THEN POSITION 0
,21??"Q CHANGE DATE R FIXED EXPE
NSES"
6707 IF CA<16 OR CA>34 THEN POSITION 0
,22??"S LIST PAYMENTS":FOR E=1 TO 400
:NEXT E:POSITION 0,20
6708 IF CA<16 OR CA>34 THEN POSITION 0
,20??""
6709 IF CA<16 OR CA>34 THEN ? ":""
":GOTO
6740
6712 IF CA=31 THEN ? "K":POSITION 0,12
??"FILING DATA -- PLEASE WAIT
":GOSUB 10000:GOTO 9000
6715 IF CA=33 THEN CA=1:GOSUB 1500:GOT
0 6005
6718 IF CA=34 THEN GOSUB 3019:GOTO 660
0
6720 IF CA=32 THEN MON1$=MON$:AT$=AZ$:
GOSUB 1000:MON$=MON1$:AZ$=AT$:GOSUB 15
00:GOTO 6600
6725 POSITION 20,22??"AMOUNT":INPUT
J:TP$=STR$(J):IF LEN(TP$)>4 AND TP$(LE
N(TP$)-2,LEN(TP$)-2)<>".." THEN 6701
6730 IF J<0 THEN GOSUB 4100:EX(CA,8)=E
X(CA,8)+J:EX(CA,0)=EX(CA,0)+ABS(J):GOT
0 6740
6735 EX(CA,W)=J:EX(CA,6)=0:FOR E=1 TO
5:EX(CA,6)=EX(CA,6)+EX(CA,E):NEXT E:EX
((CA,8)=EX(CA,6)-EX(CA,0)
6740 POSITION 0,22??":GOTO 6700
7000 ? "K":POKE 710,128:POKE 712,128:P
OKE 709,138:POSITION 0,0??"FIXED EXPENSE CATEGORIES""
7005 ? ?:?"1 RENT/MORTGAGE":?"2 ELECT
RIC":?"3 TELEPHONE":?"4 ";AS??"5 ";
BS??"6 ";CS??"7 ";DS??"8 ";ES??"9 ";
7010 ? "9 ";FS??"10 ";GS??"11 ";HS??"
```

```

"12 ";IS?: "13 ";JS?: "14 ";KS?: "15
";LS?: "16 DEFINE VARIABLE EXPENSES"
7020 GOSUB 7299
7100 POSITION 2,20?: "LABEL NUMBER";:I
INPUT E:IF E>16 THEN 7217
7110 POSITION 2,21?: "LABEL";:GOTO 720
0+E
7200 GOTO 9040
7201 GOTO 9000
7202 GOTO 9000
7203 GOTO 9000
7204 INPUT A$:GOTO 7000
7205 INPUT B$:GOTO 7000
7206 INPUT C$:GOTO 7000
7207 INPUT D$:GOTO 7000
7208 INPUT E$:GOTO 7000
7209 INPUT F$:GOTO 7000
7210 INPUT G$:GOTO 7000
7211 INPUT H$:GOTO 7000
7212 INPUT I$:GOTO 7000
7213 INPUT J$:GOTO 7000
7214 INPUT K$:GOTO 7000
7215 INPUT L$:GOTO 7000
7216 GOTO 7300
7299 FOR E=3 TO 5:POSITION 20,E?: "RET
URN TO MENU":NEXT E:RETURN
7300 ? "K":POKE 710,128:POKE 712,128:P
OKE 709,138:POSITION 0,0?: "VARI
ABLE EXPENSE CATEGORIES"
7305 ? :? "1 FOOD":? "2 CLOTHING":? "3
";MS?: "4 ";N1S?: "5 ";OS?: "6 ";PS?: "
7 ";QS?: "8 ";RS?: "9 ";SS?
7310 ? "10 ";TS?: "11 ";US?: "12 ";VS?:
"? "13 ";WS?: "14 ";XS?: "15 ";YS?
7320 FOR E=3 TO 4:POSITION 20,E?: "RET
URN TO MENU":NEXT E
7350 POSITION 2,20?: "LABEL NUMBER";:I
INPUT E:IF E>15 THEN 7417
7355 POSITION 2,21?: "LABEL";:GOTO 740
0+E
7400 GOTO 9040
7401 GOTO 9000
7402 GOTO 9000
7403 INPUT MS:GOTO 7300
7404 INPUT N1S:GOTO 7300
7405 INPUT OS:GOTO 7300
7406 INPUT PS:GOTO 7300
7407 INPUT QS:GOTO 7300
7408 INPUT RS:GOTO 7300
7409 INPUT SS:GOTO 7300
7410 INPUT TS:GOTO 7300
7411 INPUT US:GOTO 7300
7412 INPUT VS:GOTO 7300
7413 INPUT WS:GOTO 7300
7414 INPUT XS:GOTO 7300
7415 INPUT YS:GOTO 7300
7416 INPUT ZS:GOTO 7300
8000 NS=BL$:DP=LEN(TP$)+1:FOR J=1 TO L
EN(TP$):IF TP$(J,J)=". " THEN DP=J:J=N5
8005 NEXT J:NL=DP+DD:MS(N5-NL+1,N5)=TP
$:NS(N5-DD,N5-DD)=":":FOR J=N5-DD+1 TO
N5:IF NS(J,J)=". " THEN NS(J,J)="0"
8010 NEXT J:RETURN
8100 TP$=STR$(ERL(CA,W)):NS=7:RETURN
8101 TP$=STR$(CH(CA,E)):NS=8:RETURN
8102 TP$=STR$(PAY(CA)):RETURN
8103 TP$=STR$(IN(CA,W)):RETURN
8200 IF CA<16 THEN CA=E+15
8201 IF CA<16 THEN CA=E
8203 POSITION 16,E+1:GOSUB 8100:GOSUB
8000:? NS(1,N5):W1=W:W=6:GOSUB 8100:GO
SUB 8000:POSITION 24,E+1
8205 ? NS(1,N5):W=8:GOSUB 8100:GOSUB 8
000:POSITION 32,E+1?: NS(1,N5):W=W1:E=
E+1:RETURN
8999 GRAPHICS 0
9000 TRAP 9500:POKE 559,34:POKE 710,17
4:POKE 712,174:POKE 709,160:POKE 752,1
?: "R":POSITION 0,4:POKE 53774,112
9005 ? "
9010 POSITION 10,6?: "A = BUDGET - FIX
ED":POSITION 10,7?: "B = BUDGET - VARI
ABLE":POSITION 10,8
9015 ? "C = CHANGE DATE":POSITION 10,9
?: "D = CHECKING ACCOUNTS":POSITION 10
,10?: "E = DEFINE CATEGORIES"

```

```

9017 POSITION 10,11?: "F = FILE DATA":
POSITION 10,12?: "G = GET DATA"
9018 POSITION 10,13?: "H = CLEAR DATA"
9020 POSITION 10,17?: "COMMAND?"
9022 POSITION 0,19?: "
":OPEN #1,4,0,
"K":GET #1,J:CLOSE #1
9035 IF J=71 THEN ? "K":POSITION 16,10
?: "GET DATA":POSITION 14,11?: "ARE YO
U SURE?":GOTO 9037
9036 GOTO 9038
9037 OPEN #1,4,0,"K":GET #1,E:CLOSE #
1
9038 IF J=71 THEN IF E=89 THEN GOSUB 6
002:GOSUB 10200:GOTO 9000
9040 IF J=70 THEN ? "K":POSITION 15,10
?: "FILE DATA":POSITION 14,11?: "ARE
YOU SURE?":GOTO 9042
9041 GOTO 9043
9042 OPEN #1,4,0,"K":GET #1,E:CLOSE #
1
9043 IF J=70 THEN IF E=89 THEN GOSUB 6
002:GOSUB 10000:GOTO 9000
9045 IF J=68 THEN GOSUB 6002:POSITION
0,21?: MONS;"LOADING -- PLEASE WAIT
":GOSUB 10200:GOTO 5000
9050 IF J=65 THEN CA=1:GOSUB 6002:POSI
TION 0,21?: MONS;"LOADING -- PLEASE W
AIT":GOSUB 10200:J=65
9052 IF J=65 THEN GOSUB 1500:GOTO 6005
9055 IF J=66 THEN CA=17:GOSUB 6002:POS
ITION 0,21?: MONS;"LOADING -- PLEASE
WAIT":GOSUB 10200:J=66
9056 IF J=66 THEN GOSUB 1500:GOTO 6600
9057 IF J=69 THEN 7000
9060 IF J=67 THEN GOSUB 1000
9065 IF J=72 THEN ? "K":POSITION 14,10
?: "CLEAR DATA":POSITION 13,11?: "ARE
YOU SURE?":GOTO 9067
9066 GOTO 9000
9067 OPEN #1,4,0,"K":GET #1,E:CLOSE #
1
9068 IF J=72 THEN IF E=89 THEN ? "K":P
0SITION 14,10?: "CLEARING!":POSITION 1
3,11?: "PLEASE WAIT"
9070 IF J=72 THEN IF E=89 THEN FOR E=0
TO 7:FOR J=1 TO 30:EX(J,E)=0:NEXT J:N
EXT E
9099 GOTO 9000
9500 X=PEEK(195):IF X=3 OR X=5 THEN IF
CA>15 THEN TRAP 9500?: "
":GOTO 6730
9505 IF PEEK(195)=12 THEN IF CA<16 THE
N TRAP 9500:GOTO 6535
9506 IF PEEK(195)=12 THEN IF CA>15 THE
N TRAP 9500:GOTO 6730
9510 X=PEEK(195):IF X=3 OR X=5 THEN IF
CA<16 THEN TRAP 9500?: "
":GOTO 6535
9515 A=PEEK(195)
9516 IF A=130 OR A=170 THEN ? "K
FILE NOT FOUND - TRY AGAIN
":FOR
E=1 TO 100:NEXT E:CLOSE #1:GOTO 9000
9520 ERLN=PEEK(186)+256*PEEK(187):FOR
E=1 TO 10:_SOUND 0,30,10,10?: "
":INPUT
ERROR - TRY AGAIN
9530 FOR J=1 TO 2:NEXT J
9540 SOUND 0,10,10,10?: "
":INPUT
ERROR - TRY AGAIN
":FOR J=1 TO
2:NEXT J:NEXT E:SOUND 0,0,0
9550 ? "
":TRAP 9500:GOTO ERLN
10000 AZ$(7,8)=YR$:EO$=CHR$(155):OPEN
#1,8,0,AZ$:FOR E=0 TO 8:FOR J=1 TO 30:
PRINT #1,EX(J,E):NEXT J:NEXT E
10001 FOR E=0 TO 2:FOR J=1 TO 45:PRINT
#1,CK(E,J):PRINT #1,CK1(E,J):NEXT J:N
EXT E
10002 FOR E=0 TO 2:PRINT #1,CH(0,E):NE
XT E
10005 PRINT #1;AS;EO$;BS;EO$;CS;EO$;DS
;EO$;ES;EO$;FS;EO$;GS;EO$;HS
10010 PRINT #1;IS;EO$;JS;EO$;KS;EO$;LS
;EO$;MS;EO$;N1S;EO$;OS;EO$;PS;EO$;QS
10015 PRINT #1;RS;EO$;SS;EO$;TS;EO$;US
;EO$;VS;EO$;WS;EO$;XS;EO$;YS;EO$;ZS
10020 CLOSE #1:RETURN

```

```

10200 AZ$(7,8)=YR$:EO$=CHR$(155):OPEN
#1,4,0,AZ$:FOR E=0 TO 8:FOR J=1 TO 30:
INPUT #1,I:EX(J,E)=I:NEXT J:NEXT E
10202 FOR E=0 TO 2:FOR J=1 TO 45:INPUT
#1,I:CK(E,J)=I:INPUT #1,I:CK1(E,J)=I:
NEXT J:NEXT E
10203 FOR E=0 TO 2:INPUT #1,I:CH(0,E)=
I:NEXT E
10205 INPUT #1;AS,B$,C$,D$,E$,F$,G$,H$
I$,J$,K$,L$,M$,N$,$P$,$S$,$T$,$U$,$V$,$W$,$X$,
$Y$,$Z$,
10299 CLOSE #1:RETURN

```

CHECKSUM DATA

(See p.46)

```

1 DATA 253,408,929,533,882,596,747,116
,81,302,270,291,301,318,625,6652
1040 DATA 219,782,220,478,224,503,508,
302,315,226,279,315,423,745,517,6056
1075 DATA 616,453,782,710,285,577,998,
640,290,392,864,994,234,973,894,9702
4005 DATA 497,978,722,896,500,968,726,
893,88,672,597,89,926,192,99,8843
5040 DATA 104,128,815,988,739,783,639,
918,762,287,609,494,434,441,736,8877
5700 DATA 614,497,737,642,354,618,512,
239,564,500,75,426,560,511,780,7629
5910 DATA 80,702,158,510,535,944,778,5
55,386,722,523,175,693,197,432,7390
6004 DATA 797,462,419,648,239,361,45,5
8,52,56,60,64,68,72,76,3477

```

```

6100 DATA 73,77,82,164,136,558,297,849
,172,105,342,107,775,944,770,5451
6507 DATA 737,468,754,292,604,176,4,57
5,215,833,955,181,95,945,102,6936
6630 DATA 96,109,103,116,110,123,117,1
30,124,137,741,287,233,375,863,3664
6694 DATA 199,975,37,981,394,885,227,1
32,313,799,59,619,170,19,575,6304
7000 DATA 409,67,29,980,769,41,746,748
,742,744,869,872,875,878,881,9642
7209 DATA 884,868,871,874,877,880,883,
748,605,610,743,201,547,780,65,10436
7400 DATA 752,746,748,888,50,894,897,9
80,903,906,890,893,896,899,902,12164
7415 DATA 905,908,475,516,883,695,647,
48,116,72,770,570,969,110,804,8488
9005 DATA 929,844,183,323,616,965,422,
217,781,558,761,250,759,549,749,8906
9045 DATA 414,836,700,244,700,896,731,
339,754,561,537,103,763,467,989,9034
9506 DATA 982,482,292,238,140,168,713,
170,252,989,101,36,944,297,165,5969
10200 DATA 626,162,946,965,97,208,3004

```

Family Cash Flow by Jerry Falkenhan is available from The ATARI Program Exchange (APX-20080) or your local ATARI dealer. 32K disk, \$24.95.

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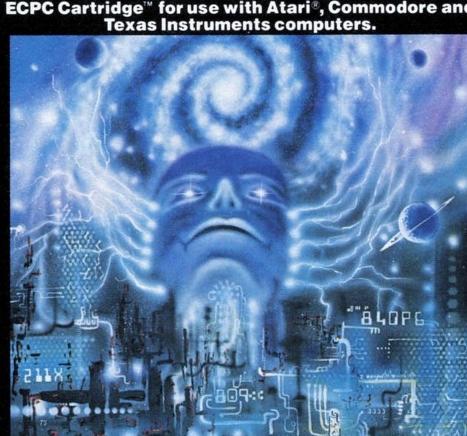
by Brian Moriarty

The home computer market is obsessed with graphics. Flip through any computer magazine and you'll find pages and pages of game advertisements, each promising high-res action graphics in at least four more colors than the hardware is capable of displaying. Game programmers spend countless hours squeezing the last pixel out of their playfields — and any dealer will tell you that a flashy title screen is worth more than a good game concept.

In this world where even the best computer games come and go in the space of a single month, the prose adventures of Infocom stand apart. Their unadorned text boasts only two colors (foreground and background); there are no illustrations, no sound effects to jazz up the action. Yet the Interlogic series is comfortably lodged in the top-25 list of every major software distributor.

New Release

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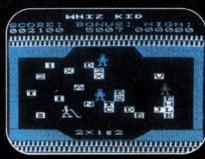


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What is Infocom's secret? Why does a 4-year-old text game like **Zork** continue to flourish when even the venerable Scott Adams Adventure Series (now "enhanced" with flickering graphics) fails to hold the interest of computer enthusiasts?

The answer, I think, has less to do with Infocom's famous packaging than with the fundamental quality of their products. When I play an Interlogic adventure, I don't get the feeling that the thing was coded according to a formula, shrink-wrapped and shoved out the door in a couple of weeks. There's a sense of completeness and pride in engineering, as if the programmer had a genuine emotional investment in the game. **Suspended**, the latest offering in the Interlogic Science Fiction Series, conveys this sense of personal authorship more than any other computer adventure I have played.

An intriguing scenario

Suspended was created by Michael Berlyn, a programmer best known as the author of the best-selling Apple adventures **Oo-Topos** and **Cyborg**. Just as this issue went to press, I received the new ATARI conversion of **Cyborg** from Berlyn's former company, Sentient Software. Look for a report on ATARI **Cyborg** in a later issue, and let's hope we'll see **Oo-Topos** in the near future.

Suspended is similar to **Cyborg** in that it puts the player in control of an imaginary cybernetic system. Your frozen brain is hooked into a network of "filtering computers" which are directly responsible for the care and feeding of an entire planet. This delicately-balanced network is maintained by a team of six robots which respond to your commands. The filtering computers allow you to address the robots individually, or in any combination.

Each robot is endowed with special hardware capabilities and a unique personality. Your job is to coordinate the action of the robots so that the planet you are babysitting remains comfortable and happy. The penalty for failure? Chaos, massive casualties and disconnection!

Like the other adventures in Infocom's Interlogic series, **Suspended** incorporates a sophisticated parser that understands complex English sentences, with a vocabulary of over 600 words. Phrases like "Put the rough object into the access panel then close the access panel" are perfectly legal; multiple commands may be entered on a single line by ending each phrase with a period. The program also accepts a number of useful abbreviations, and will support

the saving and loading of up to five separate game positions. You can choose between five levels of play difficulty (including an inconceivably tough "IMPOSSIBLE" game), or custom-design your own game configurations. These features should keep your copy of **Suspended** far away from the shelf where your "solved" adventures are gathering dust.

Suspended comes with an attractive full-color game board and a vinyl token for each robot. These allow you to keep track of where the robots are located in the planet's underground maintenance complex. The superb owner's manual provides an amusing historical background and detailed information about the robots' abilities and limitations. And let's not overlook that incredible packaging — an eerie molded mask with eyes that follow you around the room, saying "I really am worth fifty dollars!"

Clever characterizations

Berlyn's most impressive achievement in **Suspended** is his characterization of the six robots. Each responds to your commands with a rhetorical style that is fancifully suited to its function.

"Iris," the only robot equipped with visual receptors, is a wise-mouthed old woman who replies to your commands with "Okay, good looking," and interrupts the game with complaints when she needs a repair job. "Waldo" (an all-purpose worker with multiple grasping extensions) is an affable fellow with a distinctly blue-collar outlook. "Whiz" is the bookworm of the team; he communicates in a clipped, matter-of-fact manner and is only happy when plugged into an information pedestal. "Poet" reminds me of an ex-60s burnout. His replies are embellished with hip slang, horrible rhymes and obscure literary quotes.

A few hours with these electronic personalities will make them your friends. This is the kind of compliment you would normally extend to a good book or movie, not to a computer game. But the scenario and implementation of **Suspended** are so professionally crafted, that the product actually manages to transcend the typical text adventure (often nothing more than a puzzle that understands English), offering a level of involvement which can only be compared to the experience of a fine novel. That this feat is accomplished without elaborate graphics proves Infocom's contention that the mind is more imaginative than the eye.



Suspended is not without its petty annoyances. Since the room and object descriptions are stored on a disk as text files, you have to be patient while the slow 810 disk drive beeps and clacks, searching for just the right sentences. Typing commands can get pretty tiresome after several hours of play, especially if you make your living by typing all day like I do. But these inconveniences are caused by the hardware, not the software; future home computers with megabytes of RAM and voice recognition will make such limitations a thing of the past. Until then, let's enjoy the pioneering efforts of authors like Michael Berlyn and companies like Infocom, whose products are among the finest examples of a new and entertaining means of self-expression which can now be regarded as "literature" without apology. □

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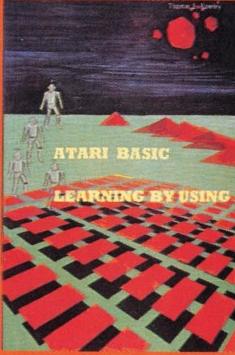
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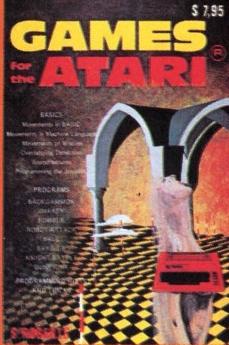
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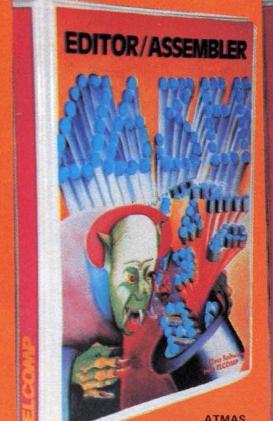
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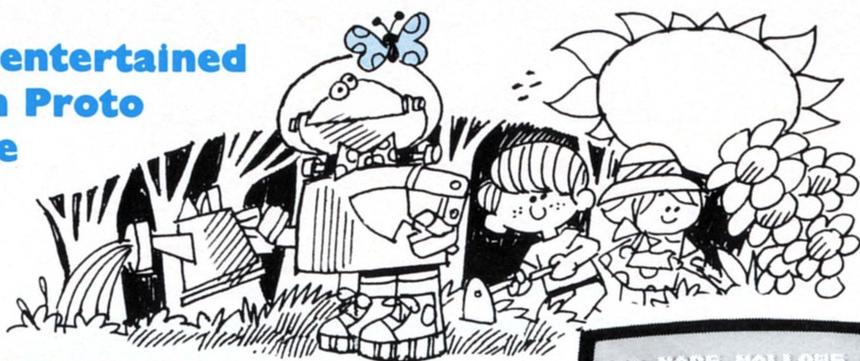
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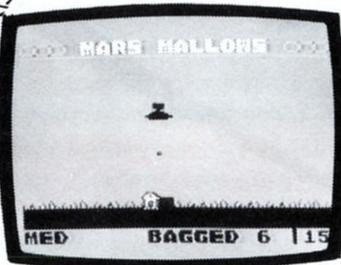
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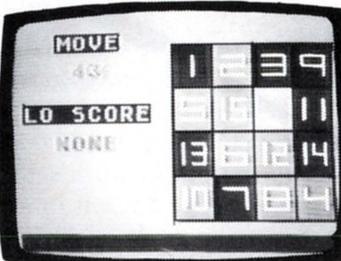
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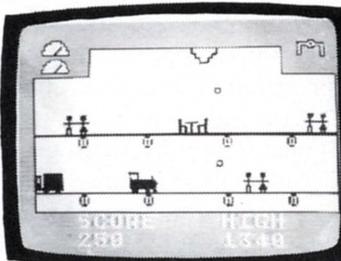
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MULTICOLOR

SCREEN

GENERATOR

16K cassette 24K disk

by Richard J. Kalagher

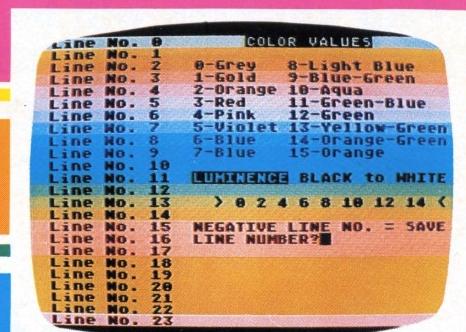
This program will allow you to develop a custom screen in Graphics Mode 0. Each of the 24 lines of text can be a different color of your own choosing from ATARI's 128 available colors. After you develop your custom screen you can save it on disk or cassette and use it in any of your own programs.

I originally developed this program for a friend who wanted to make color slides for teaching. He used this program to set up a multicolor screen. He then wrote the text on the custom screen with a BASIC program and made slides by photographing the TV screen. But that is just one of the uses for this program. You can highlight titles in a different color, create custom text windows, make text disappear when it scrolls through an area of the screen, or create colorful games in Graphics 0. You can even use it to demonstrate for your friends how an ATARI can easily put 24 colors on the screen at once.

Using The Program

Before describing how and why the program works I will discuss how to use it. Type in the BASIC program from Listing 1, save an extra copy, and RUN it. After a brief initialization, the input screen will appear. The left side of the screen should have "Line No. X" written on each line where X is the line number (from 0 to 23). This is just an aid to help you identify the line you want to change. On the right side of the screen, the color values are given, along with a reminder that luminance values vary from 0 (black) to 14 (white) in steps of two. At this point, the cursor is resting halfway down the left side of the screen waiting for you to enter a line number. Enter a number between 0 and 23. If you enter an invalid number you will be prompted again to enter a line number.

Next, you will be prompted to enter a background color. Select a number from 0 to 15 from the list at



the top of the screen. Then comes the background luminance. Zero will give you a very dark color while 14 will be a very bright color. If you enter an odd number it will automatically be rounded to the next lower even number. For example, a nine or an eight will both produce the same luminance. Finally, you will be asked for a character luminance. In Graphics mode 0 the character is the same color as the background but a different luminance. A low numerical value gives a dark character while a high value gives a light character.

When you press RETURN after entering the value for character luminance, the line you selected will change color. If you don't like the effect, enter the same line number and make the changes you want. If you want the same value for a parameter (except line number) that you previously entered, just hit RETURN at the prompt. This feature is very useful when you want to change a block of several lines to the same color and luminance. Just enter the new line number each time and hit RETURN three times until the new line changes color.

When the screen is just as you want it, enter a negative line number to save the custom screen. You will be told not to touch any keys while the program writes some data statements on the screen. The program is actually modifying itself to incorporate the new screen colors. Be sure you have made a copy of the program before this step.

You will be asked if you want to save the screen. If you say YES, just answer the questions and a subroutine will be saved on disk or cassette. You can merge this subroutine with any of your own programs by using the ENTER command. This subroutine will occupy lines 30000 to 30260 in your program. Just put a statement GOSUB 30000 in your program and you will get the custom screen.

This screen will stay until you press System Reset or execute a GRAPHICS statement in your program.

Theory Of Operation

The program works by using Display List Interrupts. The assembly language program in Listing 2 contains the interrupt code. Before each new Graphics Mode 0 line is drawn, an interrupt is generated and the machine code is executed. The code looks at the value in location COUNT to check which line is being drawn. The color for that line is taken from the table starting at COLTAB and the luminance is taken from the table starting at LUMTAB. These values are then put directly into the color registers. During the vertical blank interval, the value in COUNT is reset to 1 and the process repeats itself for the next screen.

The BASIC program in Listing 1 contains this machine language program in the DATA statements in lines 30170 to 30260. The statements in lines 30000 to 30160 POKE this code into the upper half of page 6, set the interrupt bits in the display list, and enable the interrupt code. Remember that this subroutine must be called after any GRAPHICS 0 statement in your program, although if you call the routine a second time you could call it at line 30050 since the machine language program will already be in memory. Also, line 30001 can be removed if you do not want to clear the screen.

The first part of the BASIC program is fairly straightforward: it basically sets up the input screen and after accepting the color values, POKES them into the color and luminance tables that the display list interrupt code uses. TRAP statements are used to skip around the input statements if you type in an illegal value (e.g. RETURN). The variable that was input will then retain the same value it had previously.

The code in lines 31000 to 31330 is executed when a negative line number is input. This code first modifies the DATA statements to save the custom screen. It then prompts you to save the custom screen to disk or cassette. Notice that you can enter a file name that starts with "D:" or you can enter just the name and the "D:" will be added to the beginning of the file name. (As an exercise, try modifying this section of the code to recognize file names that start with "D2:").

Other Considerations

There are several things to watch out for when using this program. First, you may notice that when you press a key, an extra scan line may momentarily appear between bands of different color. This is due to the fact that the ATARI keyclick routine uses the WSYNC register to time the keyclick. There is no easy way around this problem. You can trade off this problem for a slight constant jitter at the far right of the screen at the last line before a color change. To do this, try changing the last number in line 30170 and

the first two numbers in line 30180 to 234 (i.e. the 141, 10, and 212 should all be changed to 234's).

Another problem occurs during the I/O to the disk, cassette or printer. During I/O the line counter is not updated. The screen will roll and show random blinking colors although it will return to normal after the I/O operation is complete. If this is bothersome to you, POKE location 54286 with 64 before the I/O and then POKE in a 192 after the I/O is complete. This will turn off the interrupts so that the whole screen will become the same as Line 0.

While not a problem, be aware that if a line has the same luminance for background and character you will not be able to see the text on that line. You can use this feature, however, to make text seem to disappear on a certain part of the screen.

Conclusion

I hope you find this program and the techniques used in it useful. Don't be afraid to experiment, either. For example, if you study the code carefully you should be able to do things like changing colors of lines at will during the running of your own programs. □

```

10 REM MULTICOLOR GRAPHICS 0
11 REM SCREEN GENERATOR
12 REM
13 REM Copyright 1983
14 REM by Richard J. Kalagher
15 REM
20 COLTAB=1712:LUMTAB=COLTAB+24
30 DIM A$(15)
50 GOSUB 30000
60 PRINT CHR$(125)
70 FOR Y=0 TO 23
80 POSITION 2,Y
90 PRINT "Line No. ";Y;
100 NEXT Y
110 POSITION 20,0
120 PRINT "COLOR VALUES"
130 RESTORE 570
140 CC=15
150 FOR I=1 TO 2
160 FOR N=0 TO 7
170 READ A$
180 POSITION CC,2+N
190 PRINT A$
200 NEXT N
210 CC=24
220 NEXT I
230 POSITION 15,11
240 PRINT "LUMINANCE BLACK to WHITE"
250 POSITION 15,13
260 PRINT " > 0 2 4 6 8 10 12 14 <"
270 POSITION 15,15
280 PRINT "NEGATIVE LINE NO. = SAVE"
290 POSITION 15,16
300 TRAP 520
310 PRINT "LINE NUMBER";
320 INPUT LINE
330 IF LINE<0 THEN 31000
335 IF LINE>23 THEN 520
340 POSITION 15,18
350 PRINT "BACKGROUND COLOR";
360 TRAP 390
370 INPUT CLOR
380 IF CLOR>15 THEN 520
390 POSITION 15,20
400 TRAP 440
410 PRINT "BACKGROUND LUMINANCE";
420 INPUT LUM
430 IF LUM<0 OR LUM>15 THEN 520
440 POSITION 15,22

```

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```

450 PRINT "CHARACTER LUMINANCE";
460 TRAP 490
470 INPUT LUMC
480 IF LUMC<0 OR LUMC>15 THEN 520
490 POKE COLTAB+LINE,16*CLOR+LUM
500 POKE LUMTAB+LINE,LUMC
510 IF LINE=0 THEN GOSUB 30130
520 FOR N=16 TO 22 STEP 2
530 POSITION 15,N
540 PRINT "
550 NEXT N
560 GOTO 290
570 DATA 0-Grey
580 DATA 1-Gold
590 DATA 2-Orange
600 DATA 3-Red
610 DATA 4-Pink
620 DATA 5-Violet
630 DATA 6-Blue
640 DATA 7-Blue
650 DATA 8-Light Blue
660 DATA 9-Blue-Green
670 DATA 10-Aqua
680 DATA 11-Green-Blue
690 DATA 12-Green
700 DATA 13-Yellow-Green
710 DATA 14-Orange-Green
720 DATA 15-Orange
30000 REM SUBROUTINE TO LOAD MACHINE CODE, SET INTERRUPT BITS, AND ENABLE THE DLI'S
30001 PRINT CHR$(125);;"INITIALIZING...
 PLEASE WAIT":REM YOU CAN REMOVE THIS LINE IF YOU WANT
30005 RESTORE 30170:FOR N=0 TO 99:READ X:POKE 1664+N,X:NEXT N
30010 COLTAB=1712:LUMTAB=COLTAB+24
30012 REM START COUNTER AND RESET EVER Y UBI
30014 X=USR(1693)
30020 REM TELL ANTIC WHERE DLI CODE IS
30030 POKE 512,128
30040 POKE 513,6
30050 REM NOW SET INTERRUPT BITS
30060 DSTART=PEEK(560)+256*PEEK(561)
30070 FOR N=DSTART+6 TO DSTART+28
30080 POKE N,130
30090 NEXT N
30095 REM SET INTERRUPT BIT ON FIRST LINE
30100 POKE DSTART+3,194
30110 REM ENABLE DLI
30120 POKE 54286,192
30125 PRINT CHR$(125)
30130 REM HANDLE LINE 0 AS BACKGROUND
30140 POKE 710,PEEK(COLTAB)
30150 POKE 709,PEEK(LUMTAB)
30160 RETURN
30170 DATA 72,138,72,174,156,6,189,176
,6,141
30180 DATA 10,212,141,24,208,189,200,6
,141,23
30190 DATA 208,238,156,6,104,170,184,6
4,1,104
30200 DATA 169,7,160,168,162,6,32,92,2
28,96
30210 DATA 169,1,141,156,6,76,98,228,1
48,148
30220 DATA 148,148,148,148,68,148,148,
148,148,148
30230 DATA 148,148,148,148,148,148,148
,148,148,148
30240 DATA 148,148,10,10,10,10,10,10,10
,10
30250 DATA 10,10,10,10,10,10,10,10,10,10
,10
30260 DATA 10,10,10,10,10,10,0,0,0,0,0
31000 REM ROUTINE TO SAVE OBJECT CODE
31005 TRAP 40000:REM CLEAR TRAPS
31010 PRINT CHR$(125)
31020 PRINT "PLEASE DON'T PRESS ANY KEY UNTIL"
31030 PRINT "SCREEN OPERATION IS COMPLETE"
31040 FOR DELAY=1 TO 600:NEXT DELAY
31050 PRINT CHR$(125)
31060 POSITION 2,2

```

```

31070 LINE=30170
31080 FOR N=0 TO 9
31090 PRINT LINE;" DATA ";
31100 FOR I=0 TO 9
31110 PRINT PEEK(1664+N*10+I);
31120 IF I<>9 THEN PRINT ",";
31130 NEXT I
31140 PRINT
31150 LINE=LINE+10
31160 NEXT N
31170 PRINT "CONT"
31180 POSITION 2,0
31190 POKE 842,13:STOP
31200 POKE 842,12
31210 PRINT CHR$(125)
31220 PRINT :PRINT "DO YOU WANT TO SAVE THIS CUSTOM SCREEN";
31230 INPUT A$:IF LEN(A$)=0 THEN 31230
31240 IF A$(1,1)<>"Y" THEN END
31245 REM TURN OFF COLORS DURING I/O
31246 POKE 54286,64
31250 PRINT :PRINT "DISK OR CASSETTE";
31260 INPUT A$
31270 IF A$(1,1)="C" THEN 31315
31275 DIM F$(14):F$="D:"
31280 PRINT :PRINT "ENTER A FILE NAME"
;
31290 INPUT A$
31292 IF LEN(A$)=2 THEN IF A$(2,2)="""
 THEN F$=A$:GOTO 31300
31295 F$(3)=A$
31300 LIST F$,30000,30260
31310 GOTO 31325
31315 TRAP 31317:LPRINT :REM CLEAR CAS SETTE BUFFER
31317 TRAP 40000:PRINT "PRESS RECORD AND THEN RETURN"
31320 LIST "C",30000,30260
31324 REM TURN COLORS BACK ON
31325 POKE 54286,192
31330 END

```

CHECKSUM DATA (See p.46)

```

10 DATA 340,311,257,451,968,266,446,83
2,833,486,284,294,435,768,255,7218
120 DATA 436,207,266,294,309,449,861,7
72,740,261,736,472,571,480,765,7619
270 DATA 488,785,495,708,277,43,13,893
,484,951,743,75,924,494,714,8087
410 DATA 594,158,115,483,401,747,64,27
0,433,860,865,349,361,206,761,6667
560 DATA 738,311,310,660,4,307,717,324
,329,361,371,581,744,620,925,7302
710 DATA 901,875,247,366,82,738,224,17
3,210,237,201,507,593,575,213,6142
30090 DATA 687,723,991,598,348,788,143
,544,595,57,670,830,820,821,717,9332
30220 DATA 484,309,263,322,793,376,294
,773,288,28,697,781,548,263,300,6519
31090 DATA 432,270,853,533,674,807,466
,685,603,551,865,34,775,223,728,8499
31240 DATA 928,22,529,192,890,724,890
,220,896,276,571,43,214,678,990,8113
31320 DATA 889,66,368,547,1870

```

Assembly Language Listing

```

10 ;DISPLAY LIST INTERRUPT SERVICE ROUTINE
20 .OPT NOEJECT
30 ;
40 *=1664 ;UPPER HALF PAGE 6
50 ;
60 BAK=53272 ;BACKGROUND COLOR REGISTER
70 LUM=53271 ;LUMINANCE COLOR REGISTER

```

```

80 WSYNC=$4282 ;WAIT FOR SYNC
90 SETVB=$E45C
0110 JMPEND=$E462
0110 PHA ;SAVE A REGISTER
0120 TXA
0130 PHA ;SAVE X REGISTER
0140 LDX COUNT ;VALUE OF LINE ON SCREEN
0150 LDA COLTAB,X
0150 STA WSYNC ;WAIT FOR SYNC
0170 STA BAK
0180 LDA LUMTAB,X
0190 STA LUM
0200 INC COUNT
0210 PLA
0220 TAX ;RESTORE X
0230 PLA ;RESTORE A
0240 RTI ;RETURN FROM INTERRUPT
0250 COUNT .BYTE 1
0260 ;
0270 ;VERTICAL BLANK INTERRUPT ROUTINE
0280
0290 PLA ;REMOVE ARGUMENT COUNT FROM STACK
0300 LDA #7 ;DEFERRED MODE
0310 LDY #VBI & $00FF ;ADDRESS OF THE
0320 LDX #VBI/256 ;VBI ROUTINE
0330 JSR SETVB
0340 RTS
0350 VBI LDA #1
0360 STA COUNT
0370 JMP JMPEND
0380 ;
0390 ;COLOR AND LUMINANCE TABLES
0400 COLTAB .BYTE $94,$94,$94,$94,$94,$94,$94,$94
0410 .BYTE $94,$94,$94,$94,$94,$94,$94,$94
0420 .BYTE $94,$94,$94,$94,$94,$94,$94,$94
0430 LUMTAB .BYTE $A,$A,$A,$A,$A,$A,$A,$A
0440 .BYTE $A,$A,$A,$A,$A,$A,$A,$A
0450 .BYTE $A,$A,$A,$A,$A,$A,$A,$A
0460 .END

```

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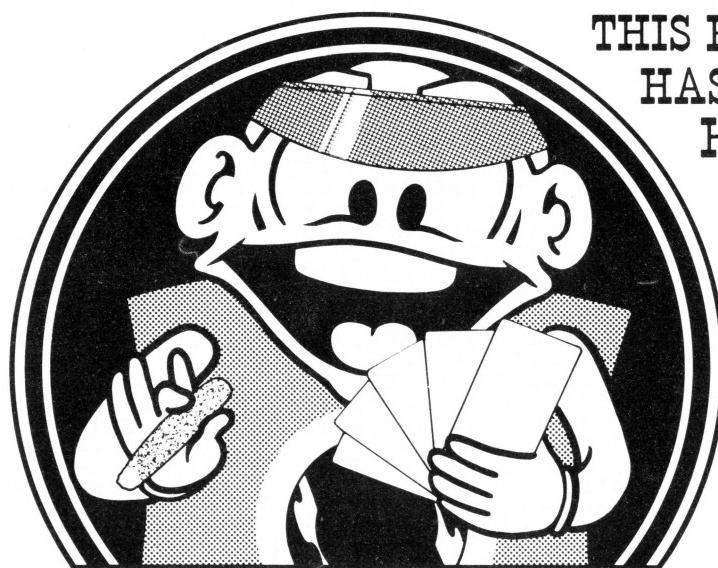
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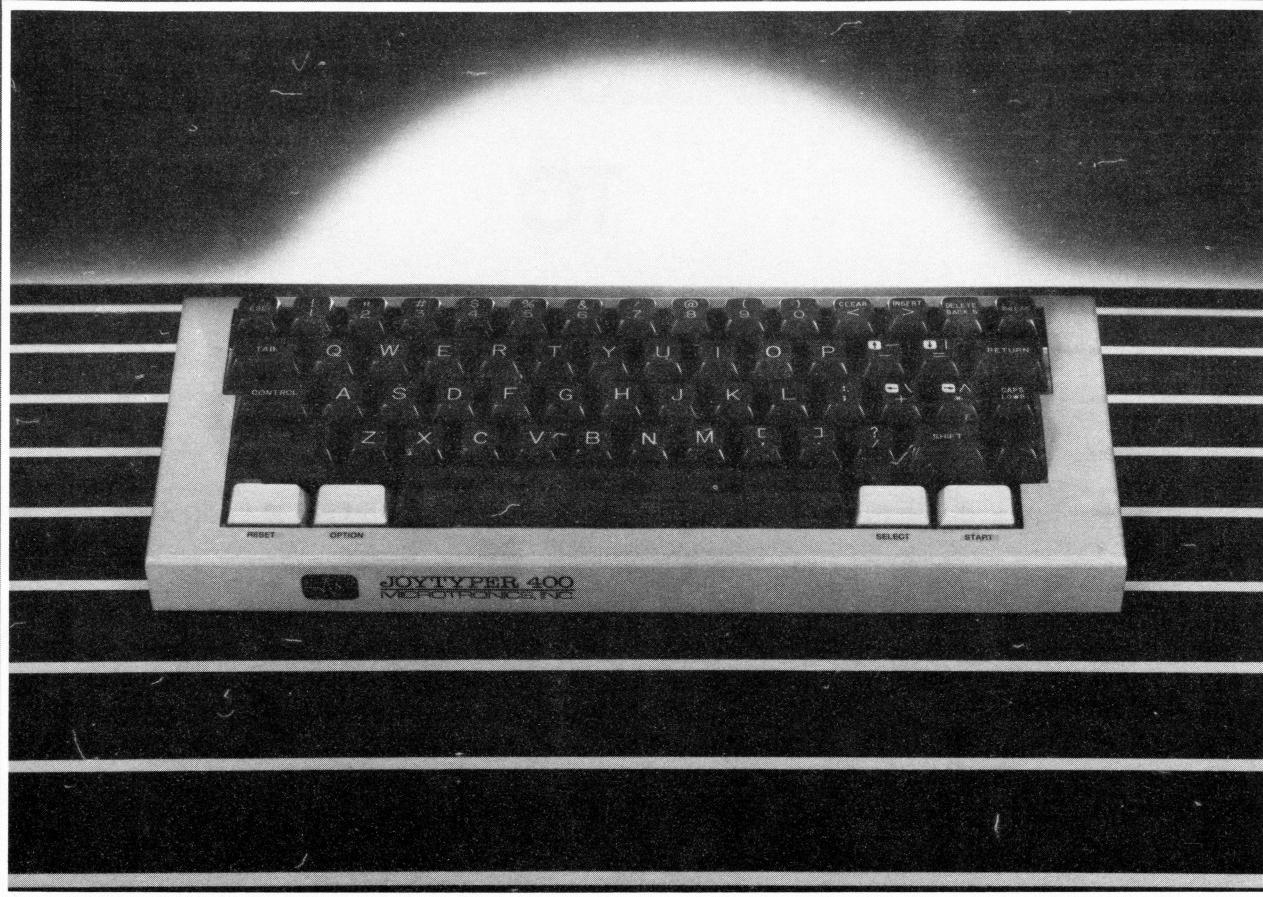
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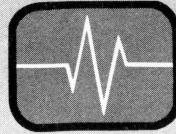
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THE A.N.A.L.O.G. GUIDE TO ATARI COMPUTER PUBLICATIONS

by Cris Popenoe and Lee Pappas

When I started this article, I had no conception as to how many books and guides actually existed for the ATARI computer owner. This listing basically covers the books, with a brief description of each. In some cases opinions are given, however this listing is intended to inform our readers of detailed publications covering specific applications.

While we have tried to make this listing as complete as possible, no doubt there are a few omissions. If any readers know of additional publications, feel free to drop me a line. —LP

LINDA A. SCHEIBER, ADVANCED PROGRAMMING TECHNIQUES FOR YOUR ATARI, including GRAPHICS and VOICE PROGRAMS, illustrated, 224pp. (0830615458), 13.95

Covers advanced programming techniques, especially graphics, color, and voice technology. Also covers sound, scrolling, display lists, and details on cassette handling.

- **ZIMMERMAN, LANCE. ATARI: A BEGINNER'S GUIDE.** BRADYR083, 12.95p.

This is a comprehensive tutorial for the 400/800. Written in a user-friendly style, this informal text is designed to help beginners understand all aspects and capabilities of the ATARI.

- **INMAN, DON and KURT. THE ATARI ASSEMBLER.** Index, 281pp. PRENTIC 81, 12.95p.

The Inmans demonstrate how to master assembly language programming and show how to use the ATARI Assembler Cartridge with an ATARI 400 or 800. The book is designed for readers with some knowledge of the BASIC programming language, but assumes no assembly language background.

- **HASKELL, RICHARD, E. ATARI BASIC.** SPECTRUM83, 13.95p.

This book provides a solid introduction to BASIC programming on the ATARI. Haskell provides a hands-on, top-down approach to programming and his instruction is augmented by a wealth of examples which cover topics such as low and high resolution graphics, loops and arrays, sound effects, bar graphs, and animated graphics.

- **ROWLEY, THOMAS E. ATARI BASIC: LEARNING BY USING.** 73pp. IJG81, 5.95p.

This book provides a supplementary resource for learning BASIC programming on an ATARI. The short programs and learning exercises are easy to follow and make learning programming enjoyable. Hands on interaction with the computer is essential. Most of the programs are written using simple ATARI BASIC statements; a few use sophisticated programming techniques. To benefit from this book, the user should have an elementary knowledge of BASIC programming techniques. 16K of memory is required for some of the routines.

- **ALBRECHT, BOB, LEROY FINKEL, and JERALD BROWN. ATARI BASIC—A SELF-TEACHING GUIDE.** 332pp. WILEYJO79, 10.95p.

This book shows you how to read, write, and understand the ATARI BASIC programming language. The authors provide a clear, easy-to-follow self-teaching manual which has been published in conjunction with ATARI. Numerous applications and games are also included.

- **HELD, GILBERT. ATARI BASIC, QUICK REFERENCE GUIDE.** WILEYJO82, 2.95p.

This Quick Reference Guide is printed on heavy coated stock, making it a handy item to have alongside you at the keyboard. Among the areas presented are the following: generic terms, BASIC operators, file naming convention, system commands, BASIC language statements, sound parameters, I/O control, and graphics and video control.

- TAYLOR, JOHN **ATARI 400/800 DISKGUIDE**, 32pp. OSBORNE83, 7.95p.

This spiral-bound, computer-side guide contains all the important ATARI 400/800 commands and functions — DOS, ATARI BASIC, numeric functions, machine functions, and many others are all clearly summarized.

- KOHL, HERB, TED KAHN, LEN LINDSAY, and PAT CLELAND. **ATARI GAMES & RECREATIONS**. Many illustrations, index, 350pp. RESTON82, 14.95p.

This book offers a different approach to introducing programming to the beginning computer user. The authors encourage you to develop your own ideas for computer games and provide models from which to draw ideas for such games. You'll start with easy games that will serve as building blocks for more complex and creative programs. At the end of each chapter are sophisticated programs that will interest experienced programmers or beginners who want a challenge. You'll learn how to develop your own programming styles and have fun as you do it. And in the process you'll discover and master all the capabilities of your machine. In addition to games, there is a special section on the graphics, sound, and color features of your ATARI.

- CONLAN, JIM and TRACY DELIMAN, et al. **ATARI PILOT FOR BEGINNERS**. Index, 229pp. RESTON83, 14.95p.

This book teaches you how to give commands to your ATARI computer in the language known as PILOT. It is designed for users with an ATARI 400 or 800 home computer. PILOT is a fairly simple language which is designed to be easy to learn. The book allows the beginner to learn through play and experimentation, and all of the programs included in the book were tested by children and beginning adult computer users. Included are programs for music, color, graphics, and mathematics.

- SCHREIBER, LINDA M. **ATARI PROGRAMMING... WITH 55 PROGRAMS**. Index, 254pp. TABBOOK82, 13.95p.

This hands-on guide to programming the ATARI 800 assumes no prior computer knowledge. The first chapters acquaint the reader with the ATARI and the different accessories that can be attached to it. New terminology is introduced gradually. The following chapters teach basic programming concepts. Each one introduces a few related commands. An explanation of each command is followed by an example of the way to use the command. The programs included further illustrate the use of the command and each program is accompanied by a detailed explanation. Sound, color, and graphics are covered in several programs. A final chapter explains how to make programs crash-proof, and there's also an explanation of error codes.

- MOORE, HERB, JUDY LOWER, and BOB ALBRECHT. **ATARI SOUND & GRAPHICS—A SELF-TEACHING GUIDE**. Index, 234pp. WILEYJO82, 9.95p.

This excellent guide opens up the vast creative possibilities of artistic programming to owners of the ATARI 400 and ATARI 800—the most visually advanced home computers available today. With this self-paced, self-teaching guide, you'll advance progressively through simple techniques for creating an array of sounds and images. Even if you're a beginner with no computing experience, this easy-to-follow book lets you start seeing and hearing things on your ATARI right away. You'll learn how to compose and play melodies, draw cartoons, create sound effects and games, and progress to more sophisticated artistic programming. And because the book uses BASIC and requires no programming knowledge, you'll learn elementary BASIC programming in the context of each newly introduced technique.

- **ATARI TECHNICAL USER'S NOTES**. Loose-leaf. ATARI81, (CO16555), 27.00

This information package provides details for the experienced programmer on the internal workings of the 400 and 800 computers. Also available from ATARI, source code listings for DOS and the operating systems.

- ELLIS, MARK, ROBERT ELLIS, JOEL GOLDSTEIN. **ATARI USER'S GUIDE: BASIC AND GRAPHICS FOR THE ATARI 400/800/1200**. 300pp. BRADY83, 15.95p.

This comprehensive guide presents through an easy to read, yet detailed explanation, ATARI BASIC and graphics. This book covers specific information on the 400, 800, and the 1200XL computers, along with an outline on how a computer works. This guide also includes applications in graphics, word processing, and business.

- STANTON, JEFFREY, ROBERT P. WELLS and SANDRA ROCHOWANSKY. **THE BOOK OF ATARI SOFTWARE** 1983. Resource listing, index, 8½" x 11", 347 pp. BOOKCOM83, 19.95p.

This is an exemplary resource manual. The software reviews have been prepared by computer professionals and each evaluation is written by an expert in the field. The programs are grouped by type. The major areas covered are business, education, communications, data base management, and entertainment. Each of the software critiques is lengthy and to the point.

- **COMPUTE!'s FIRST BOOK OF ATARI**. Spiralbound, 192pp. COMPUTE!81, (094238600), 12.95
Helpful information from the pages of COMPUTE! including applications and useful programs. Also included are unpublished articles and memory map data.

- **COMPUTE!'s FIRST BOOK OF ATARI GRAPHICS**. Spiral-bound, 248pp. COMPUTE!82, (0942386086), 12.95
This easy to use book provides programs, games, tutorials, and articles along with other helpful information for the experienced and inexperienced ATARI owner. Chapters cover animation, advanced graphics techniques, and redefining characters.

- **COMPUTE!'s SECOND BOOK OF ATARI**. Spiral-bound, 250pp. COMPUTE!82, (094238606X), 12.95
Previously unpublished information from the editors of COMPUTE! Magazine. Included are programs and helpful articles on graphics and game utilities.

- LARSEN, SALLY GREENWOOD. **COMPUTERS FOR KIDS: ATARI EDITION**. 11" x 8½", 82pp. CREATIV81, 4.95p.

This book is well-illustrated and easy-to-understand. The large type makes it accessible to children. Kids can find out how to put together a flowchart, and how to get a computer to do what they want it to do. They also learn the basics of computing and how to write their own games and draw pictures that move. There's also a section of hints for parents and teachers.

● **WILLIS, JERRY and MERL MILLER. COMPUTERS FOR PEOPLE.** Index, 200pp. DILITHI82, 7.95p.

This book would be suitable for anyone thinking of buying a small home computer, but it is most useful for those who are seriously looking at the ATARI. The book at times seems to be a promotional effort for ATARI, with many glossy color photographs of the ATARI and its peripherals throughout. The information is sound and reasoned and, while biased, is generally to-the-point and helpful. The authors begin by describing the many uses for computers in the home and office, emphasizing educational and game applications as well as business ones. One helpful feature of the book is a collection of suggestions for finding the computer that best suits your needs — an ATARI of course! The book concludes with an annotated resource guide and a glossary.

● **SMALL, DAVID and SANDY, and GEORGE BLANK, eds. THE CREATIVE ATARI.** Many illustrations, 8½" x 11", 250pp. CRCOMPUS3, 15.95p.

This book contains a collection of articles, columns, and tutorials on the ATARI which originally appeared in **Creative Computing Magazine**. The material is organized into four sections: an introduction, with a discussion of ATARI memory concepts essential to programming; a tutorial on ATARI graphics; a collection of programming tips; and a wealth of ready-to-run programs along with reviews of commercial programs available for the ATARI.

TOM ROWLEY, DESIGNS FROM YOUR MIND: ATARI GRAPHICS, RESTON

Two sections, the first for novices, the second covering advanced graphic techniques. A guide to graphics and color on the ATARI with chapters on combining graphics with text, player/missile graphics, and creating graphic shape tables.

DE RE ATARI. Many charts, 8½"x11", index, 150+pp. ATARI81 (APX90008), 19.95

This handbook for advanced programmers was written by Chris Crawford, Jim Dunion, and other specialists at ATARI. This series of tutorials covers, in detail, the techniques required to fine scroll, move player/missiles, operate vertical blanks, and fully utilize the potential of the ATARI 400 and 800 home computers. An indispensable manual for the advanced ATARI programmer.

FORTH ON THE ATARI: LEARNING BY USING, ELCOMP, 7.95

Covers the interesting language of FORTH for the ATARI. A language useful in manipulating graphics on the ATARI and programs that run much faster than BASIC. For beginners and those interested in becoming familiar with this advanced programming language.

● **ROBERTS, SAM D. GAMES FOR THE ATARI.** 115pp. IJG82, 7.95p.

This book is more than a mere listing of game programs. The first part provides clear instructions in techniques. Included are guidelines on drawing figures on the screen, movements, and sound. The selection of games is varied, and they take full advantage of the graphics and sound capabilities of the ATARI.

● **ROBERTS, SAM D. HOW TO PROGRAM YOUR ATARI IN 6502 MACHINE LANGUAGE.** 106pp. IJG82., 9.95p.

This book provides instruction in programming the ATARI in 6502 machine language. Also covered is the use of an assembler and the development of machine language subroutines from BASIC. The author provides thorough, hands-on guidelines.

● **CARRIS, BILL. INSIDE ATARI BASIC—A FAST, FUN, & FRIENDLY APPROACH.** 192pp. RESTON83, 12.95p.

This book intentionally avoids flowcharts, unnecessary technical details, and much of the computer jargon used in other books. The idea is plain language which the author hopes will lead to painless learning. The writing style is informal and humorous and all the basics are covered. Carris is Training Director with the Home Computer Division of ATARI.

INSIDE ATARI DOS. Spiral-bound. COMPUTE! (0942386027), 19.95

Written by the authors of the ATARI Operating system, this step-by-step book to the DOS system, is complete with comments and source listings. By Bill Wilkinson of Optimized Systems Software. An excellent guide to understanding the ATARI DOS.

● **CARLSON, EDWARD H. KIDS AND THE ATARI.** Spiral-bound, 218pp. RESTON83, 19.95p.

This lively introduction will have kids programming the ATARI in hours. Step-by-step lessons, exercises, and illustrations add to the book's utility as do the many games and homework drills. There are also notes for teachers and parents.

MAPPING THE ATARI. Spiral-bound, 194pp. COMPUTE!83, (0942386094), 14.95

The finest memory guide listing and sourcebook for the ATARI home computers. For programmers of all types, A.N.A.L.O.G. highly recommends this book. Crammed with information you can use on a daily-programming basis.

MASTER MEMORY MAP. 32pp. Educational Software, 6.95

Over 500 memory locations in an easy to read format. Helpful to beginning programmers in teaching which memory locations are important.

● **NORTH, ALAN. 101 ATARI COMPUTER PROGRAMMING TIPS & TRICKS.** 126pp. ARCSOFT83, 8.95p.

This is a collection of programming techniques and shortcuts for the ATARI 400/800, each featuring a complete, ready-to-run program. Included are techniques for graphics, games, educational tools, and home financial aids. It's a simple, straightforward account.

● CAPITAL CHILDREN'S MUSEUM. PAINT. RESTON. 39.95.

This software package for use on the ATARI 800 enables individuals who thought they couldn't draw a straight line to create colorful works of art. Utilizing the color capacities of the ATARI, the Capital Children's Museum of Washington D.C. has developed a software package which allows users to create their own computer paintings. The PAINT diskette provides access to hundreds of color textures, allowing users to produce a virtually limitless number of artistic patterns, textures, and variations. There's even a special way to save art once it has been created. An accompanying manual provides instruction and documentation. The software requires 48K and a joystick.

● THORNBURG, DAVID D. PICTURE THIS! — AN INTRODUCTION TO COMPUTER GRAPHICS FOR KIDS OF ALL AGES. Spiral-bound, index, 8"x11", 191pp. ADDISON82, 14.95p.

This book is designed as a handbook for those owning an ATARI 400/800 home computer. A remarkable combination of two modern educational tools, PILOT and Turtle Geometry, makes it possible to solve problems, create pictures, and invent games on your ATARI. PILOT is a powerful computer language that is simpler than BASIC and allows kids to talk with the computer. Turtle Geometry allows kids to create pictures in full color with a myriad of designs. It's a wonderful book which features a step-by-step approach which integrates projects throughout for constant learning reinforcement. And it's fun too!

MARK THOMPSON, PROGRAMMING YOUR ATARI COMPUTER, illustrated, 280pp. (080604532), 10.95

An introduction to computers and the ATARI in specific. Covers the fundamentals of BASIC, internal workings of the ATARI, and the ATARI peripherals. Program listings including two games are included.

● POOLE, LON, MARY BORCHERS, and STEVEN COOK. SOME COMMON BASIC PROGRAMS: ATARI EDITION. 8½" x 11", 200pp. OSBORNE81, 14.99p.

You can key these 76 short programs directly into your ATARI 400 or 800 computer and obtain a powerful collection of financial, statistical, and mathematics programs. Each program is presented with complete source listings, documentation, and sample execution.

STIMULATION SIMULATIONS: ATARI EDITION. HAYDON, 5.95p.

This book contains a dozen programs (games) in ATARI BASIC. The programs are well documented and are complete with listings, sample runs, instructions, and flowcharts. Several types of games are represented including space, fishing, and adventure.

● NORTH, ALAN. 31 NEW ATARI COMPUTER PROGRAMS FOR HOME, SCHOOL, OFFICE. 95pp. ARCSOFT83, 8.95p.

This book contains a collection of ready-to-run programs which are designed to be easily input into an ATARI 400 or 800. Included are programs for the home, classroom, or small business. Each is at a level accessible to novice users.

● BOOM, MICHAEL. UNDERSTANDING ATARI GRAPHICS. 4½" x 11", 48pp. ALFREDP82, 2.95p.

This hands-on manual teaches you how to create graphics on ATARI models 400 and 800. The book is directed at beginning and intermediate programmers. You will need to know ATARI BASIC, though you do not have to have prior programming experience. The book begins with basic terms and concepts important to graphics programming. Next it examines each of the ATARI BASIC commands used for generating video graphics. Final sections provide additional tips.

● BEIL, DONALD H. THE VISICALC BOOK: ATARI EDITION. Many illustrations, index, 313pp. PRENTIC82, 14.95p.

Personal computer users and hundreds of businesses across the U.S. are discovering a wide variety of uses for VisiCalc software. With VisiCalc, you design the model you wish to use, so you are able to examine every step of your business operations. If you are presently using VisiCalc on your ATARI home computer, and want to learn more about its expanded uses, or are thinking about purchasing VisiCalc, this book should be very helpful. It will show you how to build a model, enter your data, and begin to explore various business and financial questions. The book includes many practice problems and a wealth of illustrative exercises.

● POOLE, LON, MARTIN McNIFF, and STEVEN COOK, YOUR ATARI COMPUTER: A GUIDE TO ATARI 400/800 PERSONAL COMPUTERS. Many illustrations, 464pp. OSBORNE, 16.95

One of the most comprehensive books concerning the ATARI ever written. Between the covers one can find a wealth of information which is organized and written in a clear, concise manner. This 11 chapter book covers graphics (beginner and advanced), BASIC, sound, and the ATARI peripherals. The finest book for novice ATARI owners.

● The above list was excerpted from **Computers: A Comprehensive Guide**, written and provided by Cris Popenoe, Yes! Bookshop, 1035 31st St., NW, Washington, DC 20007. These and over a thousand other computer related books are reviewed in the guide and are available by mail order or by calling (202) 338-2727.

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by Brian Moriarty

Since the publication of my article on **Disk Backup Programs** in Issue #11, our office has been swamped with phone calls and letters from readers interested in the technology of software protection. Many of these people had questions about disk drive modifications — and nearly everyone wanted to know more about a mysterious product called "the Happy Drive."

At first we were hesitant to publish reviews or advertisements for the Happy 810 Drive Enhancement because of its unique potential for misuse. But after receiving a sample unit from Happy Computing and working with it for a couple of weeks, we decided that the legitimate performance benefits it offers are too significant to ignore. We hope this article will help clear up some of the misinformation surrounding the Happy drive, and that it will encourage the ATARI community to deal with the existence of such products in an intelligent, informed manner.

Learning how to read.

The Happy Enhancement is a plug-in circuit board that completely replaces the operating system of the ATARI 810 Disk Drive. It's designed to improve the efficiency of disks reads, provide a greater degree of control over disk formatting and reduce wear and tear on the drive mechanism.

To better understand how the Happy Enhancement works, let's take a look at the way an unmodified 810 reads a disk.

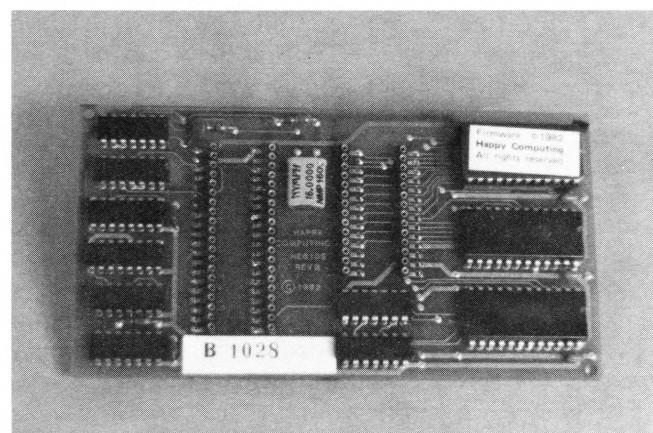
An 810 read operation begins when your ATARI commands the drive to fetch a particular sector. The controller system inside the 810 physically positions the read/write head over the track containing the requested sector, and waits for that sector to pass over the head. Then it reads the sector data into the 810's 128-byte disk buffer, checks the data for accuracy and dumps the contents of the buffer into the ATARI over the serial bus.

This method of disk reading works fine if all you need is a single sector. But most disk operations consist of multiple reads, in which several consecutive sectors must be pulled off the disk. It takes time to transmit those 128 bytes of sector data over the serial bus; during this period, the spinning disk may have carried the next physical sector away from the drive head. That means you have to wait a few fractions of a second between each sector access so that the disk can "catch up" with the read requests.

One way to improve the speed of disk reads would be to carefully interlace consecutively-numbered sectors on the tracks, so that sectors would pass over the head just as the drive was ready to read them. ATARI did just this when they released the revision "C" OS ROM for the 810 back in 1981. C-formatted disks boot up noticeably faster than disks prepared with the original "B" ROMs. But it still requires several complete disk revolutions to access every sector on a given track.

The Evelyn Wood solution.

The Happy 810 Drive Enhancement represents a complete re-thinking of the 810's disk-read process. Instead of the 128-byte disk buffer used by a normal 810, the Happy Enhancement incorporates a 4K buffer that can easily store an entire track's worth of data (18 sectors or 2304 bytes) all at once.



When a Happy drive is commanded to fetch a particular sector, it actually reads the entire track containing that sector into its giant buffer. This 18-sector "batch" read requires an average of only 1.05 disk revolutions! Subsequent sector requests from the same track are pulled out of the buffer, not off the disk. This means that the speed of sequential disk reads is limited mainly by the data transfer rate of the serial bus.

What does Happy's batch-read capability mean to you, the 810 user? Figure 1 shows the amount of time it takes to boot in the ATARI DOS.SYS and DUP.SYS files with and without the Happy Enhancement, using disks formatted under both versions of the 810 OS ROM. Figure 2 compares the speed of initializing a disk using DOS option "I."

Figure 1. DOS/DUP.SYS boot speeds

B-format, without enhancement	18 seconds
C-format, without enhancement	14 seconds
Either format, with enhancement	11 seconds

Figure 2. Disk formatting speeds.

Without Happy enhancement	38 seconds
With Happy enhancement	25 seconds

One of the nice things about a Happy drive is that it doesn't work as hard as a normal 810. That translates directly into longer equipment life. The difference is most dramatic when performing an intermittent disk read operation, such as ENTERing a file with BASIC or LOADING screens into a FORTH compiler. It's strange to watch the drive motor shut off while the computer continues to "beep," busily reading sectors out of Happy's 4K buffer. Happy Computing estimates a 30% reduction in drive wear over a standard 810.

The Happy Enhancement only affects the speed of disk read operations. Disk writes take place at the same miserably slow speed as an unmodified 810. Also note that a disk which has been DOS-formatted with a Happy drive will not boot faster on a normal drive, because Happy's DOS format is the same as the one used by the ATARI "C" ROM. I emphasize "DOS format" because, unlike a normal 810, this is not the only format a Happy drive knows how to write.

Custom disk formats.

The Happy drive's most controversial feature is its ability to recognize and reproduce non-standard disk formats. Happy's programmable operating system allows you to access individual sector ID headers, timing information and other parts of a disk you can't touch with a conventional drive. This means that, for the first time, ordinary folks like you and me can create special disk formats to meet the needs of a specific application. It also means you can recreate anybody else's special format, including those used for the purpose of copy protection.

The basic Happy 810 Enhancement kit comes with a disk program called Happy Backup. Happy's advertising says this program is "guaranteed to produce executable backup copies of any disk which can be read with a standard ATARI 810." The duplicate becomes a magnetic image of the source, and includes all protection features which may have been encoded into the original disk. I tried Happy Backup on a number of disks in my software library, including those incorporating the latest in professional custom formatting. The performance of the copies fully justifies Happy Computing's claim.

The flip side of the Happy Backup disk has a routine that lets you program the Happy drive to act just like a standard 810. This makes the system compatible with software that expects the disk-read process to take place at a "normal" speed — and prevents clever software publishers from detecting the presence of the Happy Enhancement. A diagnostic program is also included to verify that the drive is working properly.

An extra \$99.95 will get you Happy Customizer, a program that works together with a Happy-enhanced drive to create non-standard disk formats on a track-by-track basis. The Customizer is great for

small software publishers who want to protect their products without resorting to a high-priced duplication house. You can experiment with super-efficient sector interlacing schemes and other exotic formatting techniques to improve the performance of your disks.

Owners of more than one Happy drive can order a multi-drive version of Happy Backup for \$49.95. This high-speed utility will let you make up to three duplicates of a standard DOS-format disk in about 2 1/2 minutes! And the Happy Compactor package (\$49.95 additional) lets you combine several boot-load programs onto a single menu-driven disk.

The installation instructions for the Happy 810 Enhancement are among the best I have ever seen. The procedure requires no soldering or special tools; you simply remove the original 810 OS chips, plug the Happy board into the empty sockets, re-install two of the chips and put the drive back together. The Happy board uses good quality components and gold-plated connectors in the places where they count most.

Is it worth \$250?

Prospective owners of a Happy 810 Enhancement should think carefully before spending. \$250 is a significant fraction of the cost of a second disk drive — and two disk drives are probably more useful to the average ATARI user than a single Happy drive. However, if you already own two or more 810s, I think you'll find the high speed and special capabilities of a Happy drive to be a worthwhile investment.

The Happy 810 Enhancement is one of the most powerful hardware modifications available to ATARI computer owners. I hope the ATARI community will not abuse this power by using the Happy drive (and other similar products) to infringe on the rights of others. If Happy users operate their equipment with fairness and maturity, we will continue to enjoy the high caliber of hardware and software engineering that makes products like the Happy Drive a pleasure to use. □



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TOTAL STRING SEARCH

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by Jerry Tucker

The introduction of an ATARI 800 into my life certainly gave new meaning to my concepts of entertainment, education and free time. Just like everyone else that first makes the big plunge, I OD'd on games for the first month. I tinkered around with BASIC and removed my hat in awe whenever that mystical entity "MACHINE LANGUAGE" was mentioned. I did my best to learn BASIC and used it exclusively for all my programming attempts (after all, I was a practical man and realized my limitations). Following two or three extensive programming projects I began to notice some of the inherent limitations of programming strictly in BASIC. I also noticed quite a few assembly language listings in monthly magazines for utilities that might possibly "spruce-up" my BASIC programs. The machine language routines often had a BASIC program that would READ the machine code from DATA statements with a FOR..NEXT loop and then POKE it into PAGE 6 or inserted it into a STRING. My curiosity got the best of me and I started entering a few into my magic machine. I was duly amazed at the difference in the speed at which the machine language executed the routines compared to their BASIC counterpart. I was, however, totally befuddled by all the PLA, STA, BEQ, and LDXs so I looked for published listings of utilities which met the needs of the program I was working on at the time.

The hammer fell when I began to develop a utility that was designed to store a large amount of data. The program was required to search all of the data for a term and then display that term and the associated data field. The program was completed with a minimum of difficulty, however, the BASIC search through the complete data file took almost two minutes. There were ways to speed up the search but most involved searching only a portion of the data field which would not always uncover a term that could be buried anywhere in the data. The logical solution was to use machine language for the search and call it from BASIC with a USR statement. I remembered reading a few articles on searches so I gathered all of them together and looked for a listing that was tailor-made for my program. They were all excellent programs and displayed their capabilities

very graphically, but none would search through my data, find a term buried in that data and returns its location in such a manner that the associated data field could be displayed. As you might expect I was now hooked and so began my submersion into machine language.

I bought and read everything I could lay my hands on that related to 6502 machine language programming. I also chose an assembler and began to experiment with searches. After many long hours and trips into never-never land the "light came on at the end of the tunnel" and Listing 1 is the final result. I have included extensive comments to help the reader follow the logic and program flow. Parts of the code might appear to be extra steps, but this was done to keep the program RELOCATABLE. This allows the use of a STRING for storage, and frees PAGE 6 for other uses.

Listing 2 is a combination BASIC loader for the SEARCH code and a demonstration of its speed. It creates a long string of characters (A\$) and asks for the input of a term (DT\$) which is randomly placed within A\$. You are then given the option of printing A\$ or going right to the search. Be warned that if you choose to print A\$ it will take a little time for all of those 10,000 characters to be printed. You will then be asked to enter any part of the entered term and when RETURN is pressed the search will begin. The machine language routine is called by line 160: C=USR[ADR(B\$), CNT, ADR (A\$), ADR (DT\$), RL, DTL]

1. ADR (B\$) is the address of the start of the machine language code.
2. CNT is the total number of records defined as the length of A\$ divided by the record length.
3. ADR(A\$) is the address of the long string.
4. ADR(DT\$) is the address of the desired term.
5. RL is the record length.
6. DTL is the length of the desired term.

The program will return in the blink of an eye with the location of the LAST occurrence of the desired term.

"Ah ha!" you respond. "What if the record I want is not the last occurrence of the term?" This could happen if the routine was used with a phone list and the only term known was the first name. Listing 1

will return only the location of the last occurrence of the name. A solution is to print every occurrence of the desired term which is accomplished with the addition of the 17 assembly instructions in Listing 3. These PRINT codes are inserted in the "FOUND" section in Listing 1 and 5 other changes are also made to keep the program relocatable. The PRINT section uses the ATARI's resident machine language subroutine that prints to the screen. In order to use this addition you must format your records with a CHR\$(0) (entered as a CTRL, []) as the last character. This signals the PRINT routine that the end of the record has been reached and to return to the search and look for another match. Listing 2 is not written to accomodate this requirement and will return some bizarre results if tried.

Listing 4 is a BASIC subroutine that will load the code that is generated by the combined SEARCH and PRINT program. The machine language is inserted into a string in a similar manner to Listing 1. The call from BASIC is also the same.

The frustrations and long hours are now behind me and I must say I totally enjoyed the development of these programs. Maybe I have only scratched the surface of machine language, but I have found a new direction for my programming efforts. □

Listing 1.

```

0100 : ****
0110 : * STRING SEARCH ROUTINE
0120 : *
0130 : * BASIC CALL CUSR(ADR(B$),CNT,
0140 : * ADR(SS$),ADR(DT$),RL,DTL)
0150 : * CNT =NUMBER OF RECORDS
0160 : * ADR(SS$) =SEARCH STRING ADDRESS
0170 : * ADR(DT$) =DESIRED TERM ADDRESS
0180 : * RL =RECORD LENGTH
0190 : * DTL =DESIRED TERM LENGTH
0200 : *
0210 : ****
0220 : * $0650 : REFERENCE ADDRESS. THE PROGRAM
0230 : * IS RELOCATABLE AND IS PLACED IN
0240 : * A STRING (B$) IN THE DEMO.
0250 : CNTLO = $CB
0260 : CNTHI = $CC
0270 : RLLD = $CD
0280 : DLLD = $CE
0290 : TEMP = $CF
0300 : SSLO = $D0
0310 : DS1 = $D1
0320 : DTLO = $D6
0330 : DTHI = $D7
0340 : DS2 = $D8
0350 : YSAVE = $D9
0360 : FNDL0 = $D4
0370 : FNTHI = $D5
0380 : 
0390 : CLD : CLEAR DECIMAL MODE
0400 : PLA : NUMBER OF VARIABLES NOT USED.
0410 : PLA :
0420 : STA CNTHI :
0430 : PLA :
0440 : STA CNTLO :
0450 : PLA :
0460 : STA SSBI :
0470 : PLA :
0480 : STA SSLO :
0490 : PLA : START PULLING VARIABLE ADDRESSES
0500 : STA DTLO : FROM THE STACK BY HI AND LO BYTE
0510 : PLA : AND SAVE THEM IN PAGE 0 FOR LATER
0520 : STA DTLO : REFERENCE. NOTICE THAT THE
0530 : PLA : ADDRESSES ARE REMOVED IN THE ORDER
0540 : PLA : THAT THEY ARE TYPED BUT IN THE
0550 : STA RLLD : ORDER HI BYTE THEN LO. UNUSED HI
0560 : PLA : BYTES ARE REMOVED BUT NOT SAVED.
0570 : PLA :
0580 : STA DLLD :
0590 : LDA #0 :
0600 : STA FNDL0 :
0610 : LDA #0 :
0620 : STA FNTHI :
0630 : 
0640 : START THE SEARCH
0650 : LDY #0 : GET THE REGISTERS READY.
0660 : BEGIN LDY #0 ; GET THE REGISTERS READY.
0670 : LDA (DTLO),Y ; FIRST BYTE OF THE DESIRED TERM.
0680 : SUBR1 CPX #0 ; 1ST CHAR OF DESIRED TERM?
0690 : BNE NOSAVE ; NO, CONTINUE COMPARISON
0700 : STY YSAVE ; SAVE INDEX TO SEARCH STRING.
0710 : NOSAVE CMP (SSLO),Y ; COMPARE IT TO THE SEARCH STRING.
0720 : BNE SUBR2 ; > SO INCREASE THE SEARCH STRING.
0730 : INC X : INCREMENT X, COMPARE IT WITH END
0740 : CPX DTLL0 : OF THE DESIRED TERM.
0750 : BEQ FOUND ; YES, HAVE MATCH AND MUST SAVE IT.

```

```

0770 : INY : A MATCH SO INCREMENT BOTH.
0780 : CPY RLLD : END OF RECORD HAS BEEN REACHED?
0790 : BCD SUBR3 : YES, THEN GO GET ANOTHER RECORD.
0800 : PHA : IF NOT, USE STACK TO SAVE DATA
0810 : TYA : TO REUSE AFTER THESE BYTATIONS
0820 : PHA : THAT INCREMENT THE DESIRED TERM
0830 : TXA : FOR ANOTHER COMPARISON.
0840 : TAY :
0850 : LDA (DTLG),Y ; FINALLY!
0860 : STA TEMP : SAVE THE NEW ADDRESS WHILE WE
0870 : PLA : REESTABLISH THE VARIABLES.
0880 : TAY :
0890 : PLA : DISCARD OLD VALUE, FREE UP STACK,
0900 : LDA TEMP : SET UP FOR ANOTHER COMPARISON.
0910 : CLC : USE TRICK TO FORCE A BRANCH AND
0920 : BCD SUBR1 : STILL KEEP PROGRAM RELOCATABLE.
0930 : 
0940 : RECORD FOUND
0950 : 
0960 : FOUND PHA : STORE THE ACCUMULATOR ON STACK.
0970 : LDA CNTHI : LOAD THE FOUND RECORD ADDRESS.
0980 : STA FNTHI :
0990 : LDA CNTLO :
1000 : STA FNDL0 :
1010 : PLA :
1020 : LDY #0 :
1030 : CPX #0 :
1040 : BEQ SUBR3 : ONCE AGAIN WE FORCE A BRANCH.
1050 : 
1060 : SUBR2 CPX #0 : SEE IF AT START OF DESIRED TERM.
1070 : BEQ AGAIN : 
1080 : LDY #0 :
1090 : LDA (DTLG),Y ; RESET D.T. INDEX
1100 : LDY #0 : GET POINTER BACK.
1110 : AGAIN LDY YSAVE : INCREMENT THE Y REGISTER AND
1120 : INY : LOOKS FOR THE END OF THE RECORD.
1130 : CPY RLLD : WE'RE NOT AT THE END SO...
1140 : BNE SUBR1 : THIS SECTION GETS NEXT RECORD.
1150 : SUBR3 LDA SSLO : WE DON'T WANT ANY EXTRA NUMBERS.
1160 : CLC : ADD RECORD LENGTH
1170 : ADC RLLD : AND STORE IT FOR REFERENCE.
1180 : STA SSLO : CARRY CLEAR, SO DON'T INCREASE HI
1190 : BCD SUBR4 : IF WE'RE HERE WE INCREMENT SSHT.
1200 : INC SSHT : 
1210 : 
1220 : SUBRA LDA CNTLO : LET'S CHECK IF WE HAVE LOOKED
1230 : BNE SUBR5 : THROUGH ALL THE RECORDS (CNT#0).
1240 : LDA CNTHI : CHECK THE HI BYTE TO BE SURE.
1250 : BEQ HOME : IF IT'S 0 TOO THEN WE'RE ALL DONE.
1260 : DEC CNTHI : IF THERE ARE ANY LEFT THEN
1270 : 
1280 : SUBRS DEC CNTLO : DECREASE THE COUNT LOCATIONS.
1290 : CLC : ONCE AGAIN WE CAUSE A BRANCH AND
1300 : BCC BEGIN : KEEP THE ROUTINE RELOCATABLE.
1310 : HOME RTS : IF WE'RE HERE, SEARCH COMPLETED.
1320 : .END : THAT'S ALL FOLKS.

```

Listing 2.

5 REM ** LISTING 2 OF "TOTAL STRING SEARCH" by Jerry Tucker: 15 February 1983

```

** 
10 DIM A$(10000), B$(200), DSS$(100), RS$(1
), CS$(50): CNT=1: RL=50
20 GRAPHICS 17: POSITION 3,10: ? #6;"INITIALIZING..": GOSUB 160
30 A$=""; A$(10000)=A$: A$(2)=A$: CNT=IN
TCLEN(A$)/RL)
40 ? "WHAT TERM WOULD YOU LIKE TO ENTER": INPUT DSS$: D$=LEN(DSS$): CS$=DSS$
45 IF LEN(DSS$)>RL THEN ? "TOO LONG!": F
OR DELAY=1 TO 1000: NEXT DELAY: GOTO 40
50 Z=INT(RND(0)*CNT): ST=INT(Z*RL+1): LN
=ST+DS-1: A$(ST, LN)=DSS
60 TRAP 150
70 ? "RECORD COUNT": CNT: ? : CHR$(34
): CS$: CHR$(34): ? : "HAS BEEN ENTERED AS": ?
: "A$("; ST, ", "; LN, ")": POKE 752, 1: ?
75 ? "IF YOU WOULD LIKE TO SEE AS PRESENTED": ? : INPUT RS$: IF RS$<>"Y" THEN GOTO 90
80 ? "AS WILL NOW BE PRINTED": FOR I=1 TO 1500: NEXT I: ? A$: FOR I=1 TO 200: NEXT I
90 ? "N": CHR$(34); CS$: CHR$(34): ? : "HAS BEEN ENTERED AS": ? : "A$("; ST, ", "; LN, ")": ?
100 ? "NOW ENTER ANY PART OF THE TERM AND THE SEARCH WILL BEGIN": POKE 752
, 0: INPUT DSS$: D$=LEN(DSS$): C=0
110 C=USR(ADR(B$), CNT, ADR(A$), ADR(DSS$)
, RL, DS)
115 IF C=0 THEN POSITION 10, 10: ? "ENTRY WAS NOT FOUND": POSITION 5, 12: ? "PRESENT RETURN TO TRY AGAIN":
116 IF C=0 THEN INPUT RS$: DSS$=""": GOTO 90
117 ? "N"
120 ? "LENGTH OF A$="; LEN(A$): ? : ? "NUMBER OF RECORDS="; CNT
125 ? : ? : CHR$(34); DSS$: CHR$(34); " LOCATED IN RECORD "; CNT-C: ?
130 SP=(CNT-C)*RL+1: ? A$(SP, SP+RL-1): ?

```

```

140 ? "HIT [RETURN] TO INSERT ANOTHER"
150 ? "RECORD NOT FOUND":? :? :TRAP
40000:GOTO 140
160 I=1:SRCH=0
170 READ SRCH:IF SRCH=-1 THEN RETURN
175 POKE 708,RND(0)*250:POKE 709,RND(0)
180 B$(I,I)=CHR$(SRCH):I=I+1:GOTO 170
19000 DATA 216,104,104,133,204,104,133,
203,104,133,209,104,133,208,104,133,21
5,104,133,214
1910 DATA 104,104,133,205,104,104,133,
206,169,0,133,212,169,0,133,213,162,0,
160,0
1920 DATA 177,214,224,0,208,2,132,216,
209,208,43,232,228,206,240,22,200,
196,205
1930 DATA 240,50,72,152,72,138,168,177
214,133,207,104,168,104,165,207,24,14
4,219,72
1940 DATA 165,204,133,213,165,203,133,
212,104,162,0,224,0,240,17,224,0,240,6
160
1950 DATA 0,177,214,162,0,164,216,200,
196,205,208,186,165,208,24,101,205,133
208,144
1960 DATA 2,230,209,165,203,208,6,165,
204,240,7,198,204,198,203,24,144,156,9
6,-1

```

CHECKSUM DATA (See p.46)

```

5 DATA 516,689,570,135,585,585,55,473,
430,487,180,931,131,637,315,6639
116 DATA 976,372,286,588,977,153,576,8
65,258,331,801,947,279,418,666,8493
1040 DATA 50,665,210,925

```

Listing 3.

```

0100 ****
0110 ;* THIS IS A SCREEN PRINT ROUTINE THAT IS
0120 ;* TO BE INSERTED IN LISTING 1 BETWEEN LINE 1010
0130 ;* AND LINE 1020.
0140 ;*
0150 ;*
0160 ;* YOU MUST ALSO ADD THE FOLLOWING
0170 ;* LINES:
0180 ;* 1284 LDY #0
0190 ;* 1286 LDA (DTLO),Y
0200 ;* YOU WILL NEED TO CHANGE LINE
0210 ;* 920 AND 1300 TO READ:
0220 ;* 920 SHORT BCC NOSAVE
0230 ;* 1300 BCC SHORT
0240 ;*
0250 ;*
0260 ****
0270 ;
0280 PRNT LDA #$9B ; A CARRIAGE RETURN TO PUT A BLANK
0290 JSR PRINT ; LINE BETWEEN RECORDS.
0300 ;
0310 LDY #000 ; THIS IS REQUIRED TO KEEP THE
0320 START YTA ; Y REGISTER INFO INTACT WHEN
0330 PHA ; GOING TO PRINT BECAUSE
0340 LDA ($8L0),Y ; THE PRINT USES BOTH REGISTERS.
0350 ;
0360 JSR PRINT ; GO LET THE ATARI DO ITS THING!!!
0370 ;
0380 PLA ; PUT THE Y REG INFO BACK IN USE
0390 TAY ; AND GET ANOTHER LETTER TO PRINT.
0400INY ;
0410 LDA ($8L0),Y ;
0420 CMP #8000 ; SEE IF IT IS A CHR$(0)
0430 BNE START ; IF NOT GO PRINT ANOTHER CHARACTER
0440 ; OR IF IT IS A CHR$(0) WE GO ON
0450 ; WITH THE MAIN PROGRAM.
0460

```

Listing 4.

```

10 REM ** BASIC LOADER FOR SEARCH AND
SCREEN PRINT by Jerry Tucker:15 Februa
ry 1983 **
20 REM ** THE BASIC CALL IS C=USR(ADR(C$),
CNT,ADR(A$),ADR(D$),RL,DRL) ***
30 REM ** THE RECORD MUST BE FORMATTED

```

```

    WITH CHR$(0) AS THE LAST CHAR. ***
40 DIM C$(170):I=1:SRCH=0:RESTORE 70
50 READ SRCH:IF SRCH=-1 THEN RETURN
60 C$(I,I)=CHR$(SRCH):I=I+1:GOTO 50
70 DATA 216,104,104,133,204,104,133,20
3,104,133,209,104,133,208,104,133,215,
104,133,214
80 DATA 104,104,133,205,104,104,133,20
6,169,0,133,212,169,0,133,213,162,0,16
0,0
90 DATA 177,214,224,0,208,2,132,216,20
9,208,208,66,232,228,206,240,22,200,19
6,205
100 DATA 240,73,72,152,72,138,168,177,
214,133,207,104,168,104,165,207,24,144
225,72
110 DATA 165,204,133,213,165,203,133,2
12,104,169,155,32,154,246,160,0,152,72
177,208
120 DATA 32,164,246,104,168,200,177,20
8,201,0,208,240,162,0,224,0,240,17,224
0
130 DATA 240,6,160,0,177,214,162,0,164
216,200,196,205,208,163,165,208,24,10
1,205
140 DATA 133,208,144,2,230,209,165,203
208,6,165,204,240,11,198,204,198,203,
160,0
150 DATA 177,214,24,144,168,96,-1

```

CHECKSUM DATA (See p.46)

```

10 DATA 733,29,822,691,952,447,878,242
,394,545,681,81,423,410,724,8052

```

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DATABASE SYSTEMS FOR THE ATARI

A Comparative Review

by Richard E. Herring

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File-Fax
TMQ Software
82 Fox Hill Drive
Buffalo Grove, IL 60090
48K Machine Language \$129.95

Data Perfect
LJK Enterprises, Inc.
P.O. Box 10827
Saint Louis, MO 63129
32K Machine Language \$99.95

CCA Data Management System
CE Software
238 Exchange Street
Chicopee, MA 01013
40K BASIC \$99.50

Along with wordprocessing and electronic spreadsheet applications, database systems are the most generally useful computer tools in an office, small business, or home management setting. Programs that allow the creation and manipulation of sets of data (databases) have a broad range of uses — from maintaining simple files like recipes and car expenses to complex business files such as accounts receivable and campaign contributions.

Database systems allow the user to establish a file, for example an address list. That file will be made up of records in a specific format which the user sets up. The record will consist of fields, each with a field name (like name, address, city, zip and phone) and a specified length. The database system will allow sorting the records to put them in the most useful order, searching for specific records or groups of records, and printing labels or columnar reports with each column representing a field.

There are four major database systems currently available for the ATARI computer. All are what would traditionally be called file management systems. Other types of database systems (multi-file, relational and network) allow the user to access more than one data file at a time. Although a variety of less sophisticated ATARI database systems are available, many of them are limited to specific tasks and do not have the flexibility and capabilities of the products described below.

General information about the four products is provided in Table 1. Note that throughout the tables included in this article, certain specifications are shown in brackets [] or parenthesis (). Brackets indicate functions to be contained in a new release, like CCA DMS version [4.2] to be released in 1983, while parenthesis mean that the text explains the feature more fully.

TABLE ONE — GENERAL INFORMATION

Feature	CCA DMS	Data Perfect	File- Manager +	File- Fax
Price	\$99.50	99.95	99.95	129.00
Version	4.1 [4.2]	1.2	4D	2.0
Minimum memory required	40K	32K	40K	48K
Language (machine language subroutines)	BASIC*	Machine	BASIC*	Machine
Are error messages displayed?	Yes	Yes	Yes	Yes
Number of loads or programs	5(2 disks)	1	3	1
Does program use colorful displays?	No	No	Yes	No
Is program menu driven?	Yes	Yes	Yes	Yes
Is standard ATARI DOS used?	Yes	No	Yes	No
Is the program diskette copyable?	Yes	No	No	No
Maximum number of drives supported	2[4]	2	4	4

One of the most important features of powerful database systems is the quality of documentation provided. Ideal documentation would include a step by step tutorial which teaches the most commonly used commands, a glossary which lists and describes commands and functions alphabetically, a detailed index, a quick reference card which can be kept close at hand and a listing of the source code so the user can investigate the workings of the program and

modify it to fit specific needs. Table 2 compares the documentation available with the programs. None of the manuals fit the ideal — this is a case where quantity is as close as you get to quality.

TABLE 2 — DOCUMENTATION

Feature	CCA DMS	Data Perfect	File- Manager +	File Fax
Pages of documentation (size of page)	63 (8.5x11)	139 (8.5x11)	103 (6x9)	139 (6x9)
Is source code available and modifiable?	Yes	No	No	No
Is a quick reference card provided?	No	No	No	Yes

In all four cases, the written documentation contains sections which describe major program functions with examples. Most of the CCA DMS documentation is devoted to descriptions of cryptic messages, like "FMI 60," arranged in numerical order and not indexed by function. The bulk of the documentation for *Data Perfect*, *File-Fax* and *FileManager +* is divided into sections by program function. *Data Perfect's* manual is the only one which contains an index. *FileManager +* provides additional summaries of major operations and a command glossary. *File-Fax* is the only program which provides a quick reference card or which has help screens built into the program. However, they list only the commands used by all computer versions of *File-Fax* and not the ATARI-specific commands. The documentation for all four programs comes in high quality ring binders and all but *File-Fax* have tabbed sections.

The first limitations of a database system will be encountered when you have to decide just what information you are going to store and in what format the program will allow you to enter it. Basically, database systems allow you to create a form with labeled blanks. Each time you fill in the blanks, a record is created. You may create records until some limit (available RAM or disk space) is reached.

Table 3 shows the limits of each program's record and file management. CCA DMS, *Data Perfect* and *File-Fax* each limit the user to less than one full screen of data. *FileManager +* allows the data for each record to spread across parts of as many as nine pages (screens); however, many program functions allow the user to manipulate files based only on information contained on the first screen. To some people maximum record length, in order to fit in all the relevant data, is critical. But as records get longer, the maximum number of records in a file decreases, reducing the utility of maintaining a database.

Another characteristic which establishes the utility of a database system is the maximum number of fields allowed in each file. All four programs are well suited to handle name and address files which

have short field lengths and few fields. If you will be creating files with a lot of text, *FileManager +* is a strong candidate, but if you need many fields, say to accumulate answers from a multiple choice/short answer questionnaire, then *Data Perfect* or *File-Fax* may be better. *File-Fax* is the only program which allows long field names, but the combined length of the field and its name can not be more than 40 characters. The other three programs limit you to short field names, which are later used for report headings.

TABLE 3 — GENERAL SPECIFICATIONS

Feature	CCA DMS	Data Perfect	File- Manager +	File- Fax
Maximum record length (characters)	249	511	2000	879
Maximum field length (characters)	110	127	100	40
Maximum number of fields per record	24	32	20	31
Maximum field name length	15 (+5 ID)	12	12	39
Maximum number of formulas per file	245 bytes	16	5	0
Maximum # of level breaks (subtotals)	1	4	0	1
Maximum # of database files on one disk	64	1	12	1
Maximum size of a database file		1 disk	1 disk	4 disks

Usually if the field name is longer than the field, the heading will truncated when reports are printed. CCA DMS overcomes this by requiring the user to specify a five character ID. This ID is substituted for the field name of short fields when reports are printed. *Data Perfect* allows the user either to use field names or to specify any other headings when reports are printed. *File-Fax* requires that report headings be typed separately from field names.

Within each record, certain fields may be established to contain formulas. The user may create two fields, price and tax, so that when data is entered into the price field, the tax field (.05 times price, for example) is automatically calculated. Later when reports are printed, level breaks for subtotals may be inserted. CCA DMS, *Data Perfect* and *File-Fax* allows the user to choose whether or not to verify by the program. You simply tell the program that each time that the field "Purchaser Name" changes, it should subtotal all numeric fields (i.e. "Quantity," "Purchase Price" or whatever other fields you may have set up).

None of the programs except *File-Fax* will allow you to have a file larger than can fit on one diskette. *File-Fax* allows data files to span up to four diskettes, but you must have a corresponding number of disk drives. *Data Perfect* and *File-Fax* also limit you to only one data file, with corresponding report and label format files, on each disk. Both Programs use a non-standard DOS. LJK DOS allows a few extra bytes to be stored in each disk sector and

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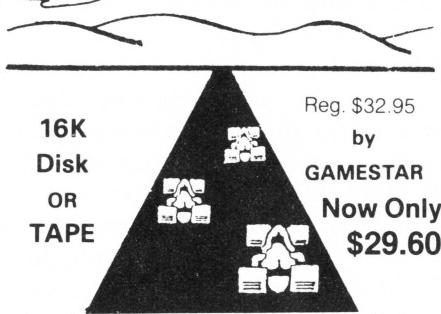
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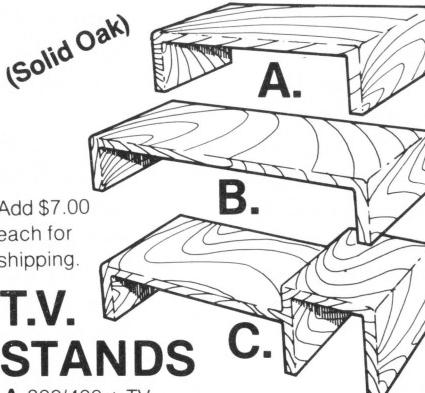
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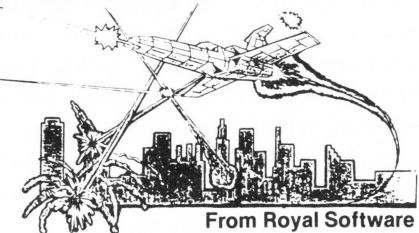
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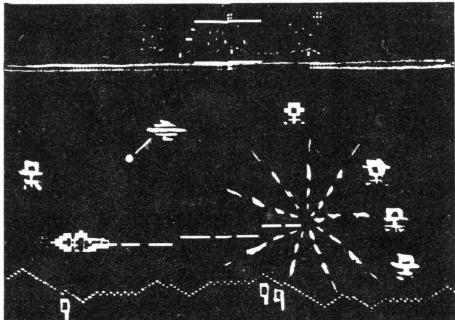
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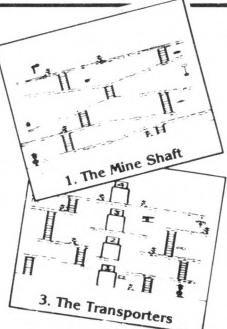
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allows the program to run faster, but limits the number of files on each disk. *File-Fax's* DOS uses a data compression scheme which substantially increases disk storage capacity. Although CCA DMS will allow 64 files on a disk, several small files (for pointers, report formats, etc.) will be needed for each data file.

Capabilities of the programs relative to the creation and editing of files are shown in Table 4. *Data Perfect* and *File-Fax* let the user design the layout of the screen by placing fields in any desired position. This allows formats like three columns each containing ten short fields. Further, during data entry with *Data Perfect*, fields will be entered in the order in which they were created. If you want to enter data into the bottom field first and work your way up, *Data Perfect* allows you to establish a format which will do so.

TABLE 4 — CREATING AND EDITING RECORDS

Feature	CCA DMS	Data Perfect	File-Manager +	File-Fax
User designed screen mask?	No	Yes	No	Yes
All keyboard editing features allowed?	Yes	Most (+)	Most	Yes (+)
Edit or delete records individually?	Yes	Yes	Yes	Yes
Edit or delete records globally?	Delete	Yes No	No	No
Are locked fields allowed?	Yes	No	No	No
Are repeating fields allowed?	No	Yes	Yes	(Yes)
Records saved to disk when entered?	Yes	Yes	Yes	Yes
Are you forced to have a back-up disk?	No	Yes	No	No

One of the real strengths of the ATARI is its advanced keyboard editing. This includes features like full cursor movement, insertion of characters and lines, and deletion of characters and lines. CCA DMS and *File-Fax* allow the use of all such features, but inserting or deleting lines during data entry with CCA DMS can create an incorrect record.

Data Perfect allows the use of all keyboard editing features except insertion and deletion of lines. Additionally, it provides several nice features like go to beginning of line, go to end of line and enter line up to cursor. *File-Fax* also provides extra editing features like home and back tab. *FileManager +* prevents inserting or deleting either lines or characters during data entry, but allows the use of those features when creating report or label formats.

Data Perfect, as well as the upcoming version of CCM DMS, will allow the global deletion of records. In other words, you could delete from a file all records in which the field "Zip Code" is 33333. Additionally, *Data Perfect* allows global editing. All products with a sale price of \$29.95 could automatically be changed to \$34.95.

Only CCA DMS allows the creation of locked fields — once data is entered into them, it cannot be changed without the field being unlocked. If you wanted to enter names and social security numbers into a customer file, someone else could later enter addresses and other data. You could prevent that person from accidentally changing a social security number by declaring it a locked field. On the other hand, *Data Perfect* and *FileManager +* allow the user to specify repeating fields.

When a blank screen mask appears for the entry of a new record, certain fields can already be filled in — you will not have to type those fields unless you want to change them. If you are entering addresses, ninety percent of which are in New York City, you could specify both the city and state fields as repeating and you would only have to enter those fields ten percent of the time. *File-Fax* can be set up to default to the previous data each time a new record is entered, but specific fields can not be selected. *File-Fax* also allows the user to choose whether or not to verify the accuracy of each record as it is entered.

FileManager +, *Data Perfect* and CCA DMS all have mathematical capabilities. Table 5 displays these in detail. All three programs allow the basic functions of addition, subtraction, multiplication, division, and exponentiation. Only *Data Perfect*, however, will allow you to place commas in long numbers. Both *FileManager +* and *Data Perfect* will recognize parenthesis in mathematical formulas as establishing priority of operation. Formulas in CCA DMS must be entered in the exact order in which operations are to occur. Although *File-Fax* can total numeric fields, it will not be able to accept formulas within fields until a planned utility disk becomes available.

TABLE 5 — MATHEMATICAL CAPABILITIES

Feature	CCA DMS	Data Perfect	File-Manager +	File-Fax
May one computed field reference another?	Yes	Yes	Yes	NA
Can program put commas in long numbers?	No	Yes	No	No
Do parenthesis set priority?	No	Yes	Yes	NA
# digits before defaulting to exponent + - * ^	10	9	10	No limit
Exponentiation	Yes	Yes	Yes	No
Square roots	No	Yes	Yes	No
Log, base 10	No	Yes	Yes	No
Log, base "e"	No	Yes	No	No
Sine, cosine and arctangent	No	Yes	No	No
Integer and absolute values	Yes	Yes	Yes	No
SGN (-1 for negative, 0 for positive)	No	Yes	No	No
RND	No	No	Yes	No
Boolean functions	No	Yes	No	No

A major advantage of an on-line database is that it allows you to search for and retrieve specific data. The less detail you have to remember about the data for the program to find it, the more powerful and

useful the program is.

Table 6 compares the search capabilities of the database systems. Searching by range of data means requesting such information from the file as all birthdays between October 15, 1949, and December 23, 1954. *FileManager +*, *File-Fax* and *Data Perfect* allow you to specify multiple levels like all files where the first name is Jim and the area code is 202. These three programs also allow wild card searches. You could add to the two criteria above the requirement that the last name start with an "H." *Data Perfect* and *CCA DMS* assign each record a number so you can also specify that as a search criterion.

TABLE 6 — SEARCH CAPABILITIES

Feature	CCA DMS	Data Perfect	File- Manager +	File- Fax
Search by range of data?	No	Yes	Yes	Yes
Maximum number of search criteria	1	9	5	31 (1/field)
Max number search criteria in 1 field	1	2	1	1
Are wild card searches allowed?	No	Yes	Yes	Yes
Can you search by record number?	Yes	Yes	No	No
Total fields in records found in search?	No	Yes	No	No
Print selected records during search?	No	Yes	Yes	Yes

Once data has been entered into a database system, the speed with which virtually any operation (searches, printed reports, etc.) is completed depends upon the physical ordering of the records in the file. Normally, records are saved in the order in which they are entered, not in alphabetical order. To make records more accessible, all database systems allow the records to be sorted. An accounts receivable file, for instance, may be sorted so that the records are in alphabetical order by the field "Company Name." If each company has several accounts, those may be placed in order by amount. In other words, there may be a primary sort of criterion, within which is a secondary criterion, within which...and so on. *CCA DMS* allows ten such sort criteria; and *File-Fax*, eight; twice as many as *FileManager +* or *Data Perfect*. All of the programs except *File-Fax* allow a subfile to be created easily from a larger database. From your original accounts receivable file, you could create a separate file of accounts which are over ninety days old.

Sorts have two possible results. The individual records may be written to the disk in their new (sorted) order or a pointer file may be created. With a pointer file, the records are not written in the new order. Instead, a short file containing the positions of the records which the sort identified as first, second, etc. points to the records which are still arranged in the original order. It's like having a file cabinet where the folders are numbered instead of being in alphabetical order.

When you want to find the file on aardvarks, you look up that word in a 3x5 index (pointer) file and find that the aardvark folder is number 702. The folders are not alphabetized — the index cards are and act as pointers. For the primary sort of criterion, both *Data Perfect* and *CCA DMS* rewrite the records in their new order. *FileManager +* and *File-Fax* create pointer files while leaving the records in the order in which they were originally entered.

The sort capabilities of the four database systems are shown in Table 7. The accuracy of a sort depends on the depth of the sort. Say you want to put an address file into alphabetical order by last name. The field "Last Name" is 25 characters long. You can alphabetize using all 25 characters, or just the first twelve, or five. As your data files grow longer, this is an important feature. The longer your file, the fewer characters the database system will sort on. With an address file of 100 records, you may be able to sort on a maximum of 255 characters. When that address file grows to 1100 records, the sort may be limited to twenty characters. All of the programs except *FileManager +* interact with the disk as they sort, thus allowing sorts of more records than can exist in memory at one time. *File-Fax* always sorts on the entire field length, but, with some loss of speed, is able to do so even for an eight level sort.

TABLE 7 — SORT CAPABILITIES

Feature	CCA DMS	Data Perfect	File- Manager +	File- Fax
User controls depth of sort in a field	Yes	Yes	Yes	No
Sorts more files than memory can hold?	Yes	Yes	No	Yes
Maximum number of sort criteria	10	4	3	8
Allows creation of subfiles?	Yes	Yes	Yes	No
Ascending sorts (A-Z) allowed?	Yes	Yes	Yes	Yes
Descending sorts (Z-A) allowed?	Yes	Yes	No	No

Other than for casual uses of database systems, their most important feature is the ability to produce printed reports in useful formats. Table 8 gives a fairly self-explanatory comparison of report generation features. All four programs allow you to search for and print certain records from your file or the whole file. *Data Perfect* has the most flexible report features including the ability to edit a report format which was saved to disk, breaks between pages without sending printer control codes, the largest report title and the most subtotal levels. *Data Perfect's* report titles can have up to seven header lines (plus two detail lines), where each line is up to 127 characters. Not all printer control codes have to be included in that title format as they do with *FileManager +*. *File-Fax* reports can be listed to the screen either with or without wrap around.

TABLE 8 — REPORTS

Feature	CCA DMS	Data Perfect	File- Manager +	File- Fax
Search allowed for report?	Yes	Yes	Yes	Yes
Can report format be saved to disk?	Yes	Yes	No	Yes
Can saved report format be edited?	No	Yes	NA	Yes
Allows sending printer control codes?	Yes	Yes	Yes	Yes
Change printer fonts within report?	No	Bold only	No	No
Can pages be automatically numbered?	Yes	Yes	No	Yes
Automatically breaks between pages?	(No)	Yes	(No)	Yes
Can user set # of lines between records?	No	Yes	Yes	Yes
Automatic dating of report by program?	No	Yes	No	No
Maximum width of printed report	150	127	132	132
Maximum # of characters in report title	120	7 lines	37	132
Maximum # of level breaks (subtotals)	1	4	0	1
Can report be listed to screen?	Yes	Format only	Yes	Yes
If report is listed to the screen, are fields broken in the middle?	No	NA	Yes	No

A specific type of report often used is the preparation of labels — commonly for mailing. Labels require that the fields to be printed be stacked one above the other rather than printed in the usual columns. Each of the four programs allows easy formatting and printing of labels. Features related to labels are shown in Table 9.

TABLE 9 — LABELS

Feature	CCA DMS	Data Perfect	File- Manager +	File- Fax
User designs layout of fields on label?	Yes	Yes	Yes	Yes
Maximum number of fields on label	24	32	(20)	31
Search allowed for label?	Yes	Yes	Yes	Yes
Print labels on specified conditions? Range only	Yes	Yes	Yes	Yes
Is totaling allowed on break fields?	No	Yes	No	Yes

File-Fax allows you to toggle to the data entry screen, "pick-up" any field, and then drop it on your label format screen. One convenient feature of File-Manager + is that when you are setting up either label or report formats, you only have to type the first letter or two of the name of each field to be printed. The program matches the letters with its list of field names and completes the typing for you. All FileManager + fields which are to appear on labels must be on the first page (screen) of the record. (Remember that FileManager + records may be up to nine screens or 2000 characters long.)

Once you have built your database file and used it for a while, you will undoubtedly find that it needs to be modified. A certain field will have become unnecessary and will be occupying valuable space. Or you will think of another field that should be included and wish that you could go back and add it without reentering all of your data. You might even want to merge two existing files with the same or similar formats into one big file.

Table 10 shows which modifications each database system allows. An upcoming File-Fax utility disk will allow existing databases to be modified. All of the programs except File-Fax require that database files be packed in order to get rid of deleted records. During the editing process, deleted records are merely flagged. They are not erased from the disk file because that would leave a hole in the middle of your data. Packing the file removes each deleted record and moves the following files forward into the blank spack. File-Fax automatically packs data files without requiring a separate step.

TABLE 10 — MODIFY EXISTING DATABASE

Feature	CCA DMS	Data Perfect	File- Manager +	File- Fax
Can database files be merged?	Yes	Yes	Yes	No
Pack database (remove deleted records)?	Yes	Yes	Yes	Automatic
Can fields be renamed?	No [Yes]	Yes	Yes	No
Can field length be changed?	No [Yes]	Yes	Yes	No
Can fields be added or deleted?	No [Yes]	Yes	Yes	No

A final topic which concerns many users is compatibility. What other software will work with the program? What peripheral devices? And, is there any chance of transferring the data file to another computer?

Table 11 shows the compatibilities of each of the database systems. Compatibility with a wordprocessor means that the database file can be read and used by the wordprocessor. For instance, you might prepare form letters to "Dear (Field 1)". When the wordprocessor prints your letters it will read your database file, insert field 1 — hopefully someone's name — in the proper place and continue printing the letter. The body of the letter might contain other references to fields in the database file, such as amount of purchase, which would also be inserted. Once the first letter is printed, the wordprocessor will print another, this time using data from the second record in your database. Letters will continue to be printed until the last record is reached.

As supplied, none of the programs will work in double-density mode. Since your database is limited to the contents of one disk by all of the programs except File-Fax, a double density drive could effectively double the maximum file size possible. A CCA DMS user, however, has modified the note and point commands in that program to make it compatible with Percom double density drives. Those changes are apparently available through CE Software to owners who request them. The next upgrade of File-Fax will reportedly be compatible with Percom drives. The fact that a program is available for several computers does not mean that

data files will be compatible. It does, however, allow a user who switches to a different computer to work with a program which is familiar.

TABLE 11 — COMPATIBILITIES

Feature	CCA DMS	Data Perfect	File-Manager +	File-Fax
Can wordprocessor use database file?	No	Letter Perfect	[Text Wizard]	No
Compatible with Visicalc?	No [Yes one way]	No	[Yes]	[Yes]
Works with Bit 3 eighty column board?	No [Yes]	Yes	No	No
Will program work double density? (Yes)		No	No	[Yes]
Works with Axlon Ramdisk?	No	No	Yes	No
Works with Macrotronics printer cable?	Yes	No	No	No
Version of program for Apple II?	Yes	Yes	No	Yes
Version of program for IBM PC?	No	No	Yes	Yes
Version of program for CP/M?	Yes	No	No	No
Version of program for Commodore 64?	No	No	[Yes]	Yes
Version of program for Osborne?	No	No	No	Yes
Version of program for NEC PC 8001?	No	No	No	Yes
Version of program for Victor 9000?	No	No	No	Yes
Result of exiting program?	Returns to BASIC	Boots new disk	Must turn off ATARI	Must turn off ATARI

The next version of CCA DMS will allow the transfer of database files to Visicalc. (Transfer in the other direction will not yet be possible.) File-Manager+ will be compatible with the planned new version of Text Wizard (which probably will not be called Text Wizard II). Also, versions of File-Manager+ are planned for the Commodore 64 and the NEC 6000.

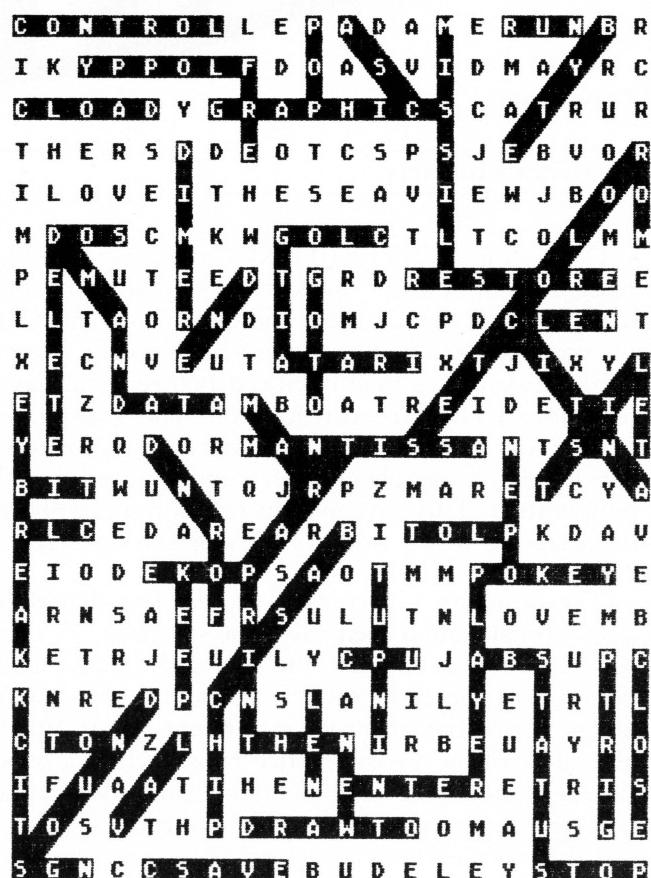
A new program from Synapse called TrendManager will be able to move data between the File-Manager+ and Visicalc formats. TrendManager is reportedly a statistical program (similar to Visiplot/Visitrend) which will allow six or more chart and graph formats. A planned File-Fax utility disk will allow files to be saved in formats compatible with Visicalc or Atari DOS. LJK's Data Perfect and Letter Perfect both use a non-standard DOS; however, a utility program (\$29.95) is available to convert files between Atari DOS and LJK DOS.

If I were to design a database system with the worst features of all four programs, it would have the short documentation of CCA DMS, have the limited report formatting capabilities of File-Manager+, and use the large number of disks (two per database file) that Data Perfect requires. Like File-Fax, it would have extremely limited mathematical capabilities and would be incapable of creating subfiles or of adding fields to or deleting fields from existing databases. Also, it would have File-Manager+'s inability to save report formats and CCA DMS's occasional problems with error handling.

If I could design the same system picking the best features described above, it would have CCA DMS's copyable disk so that users could list, study and

modify code to their hearts' content. The large maximum record length of FileManager+ and maximum number of fields allowed by Data Perfect or File-Fax would surely be included. It would be able to sort on up to ten levels like CCA DMS, and would handle sorts to any depth like File-Fax and be compatible with the Bit 3 80-column board, as are Data Perfect and (soon) CCA DMS. Data Perfect's global editing feature would be in there too. Last, files could be used by a wordprocessor (that's Data Perfect and, hopefully soon, FileManager+), and would be compatible with Visicalc (either one-way like CCA DMS or through another program like the ones planned for File-Fax and FileManager+). □

Answers to the WORD SEARCH PUZZLE, (p.45)



Another ATARI Word Puzzle by Marcy Caruthers will appear in our next issue.

UTILITY

6:



24K disk

by Brian Moriarty

Does your ATARI 810 Disk Drive have trouble reading other peoples' disks? Do your own programs load perfectly one day and "disappear" the next? If so, you may be a victim of the 810 Speed Problem.

810 disk drives manufactured before 1982 have notoriously poor speed regulation. The speed control circuit uses cheap components which make it very sensitive to changes in supply current and temperature. This can cause the rotation speed of the drive to vary wildly from its nominal setting of 285-290 RPM.

The difficulty is aggravated by the fact that early 810s contain an inadequate data separator. A data separator "spreads apart" the data and timing pulses coming off the disk, thereby improving the drive's ability to read data recorded at different speeds. Virtually all drives in the 810's price range include a good data separator; yet ATARI did not begin incorporating a reliable separator into the 810 until early 1982.

Take heart, early 810 owners! There's an easy way to find out if your drive speed is out-of-spec. **A.N.A.L.O.G. Computing** proudly presents The Snail — a highly accurate disk-drive tachometer that will help you diagnose and eliminate problems caused by ATARI's thrifty manufacturing.

Words of warning.

You will void the warranty on your 810 Disk Drive if you open it up to adjust the speed. This includes both

the regular 90-day warranty and any extended service contracts you may have paid for. If the warranty has already expired, you can fool around with your disk drive all you want, secure in the knowledge that a service technician will get richer if you foul something up. **A.N.A.L.O.G. Computing** assumes no responsibility for damages resulting from the use of the Snail program.

Now that you've been properly warned, let's take a look at The Snail.

Suppose you want to find out how fast a wheel is turning. One way to do it would be to mark a spot on the rim of the wheel and count the number of seconds it takes for the spot to make one complete revolution. Dividing 60 seconds by this figure would give you the rotation speed of the wheel in revolutions per minute (RPM).

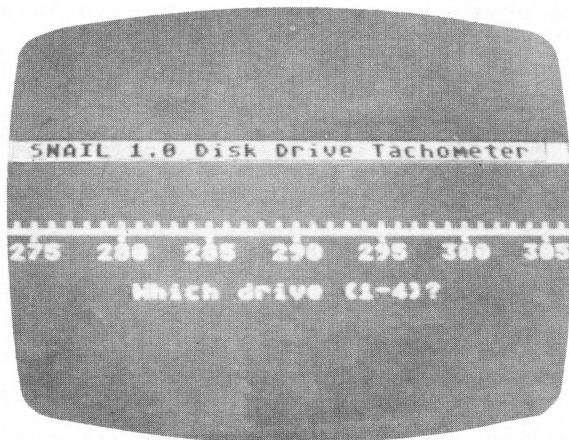
The Snail uses a similar technique to determine the speed of your 810. It tells the drive to read the first sector on a disk and records the access time in 60ths of a second (jiffies). Then it divides the access time into 3600 (the number of jiffies in a minute) to determine how fast the drive is spinning.

To assure accurate timings, The Snail averages the results of 32 consecutive readings before dividing. This "smooths out" the data enough to eliminate short-term speed variations that could produce misleading results.

No ATARI program is complete without a nifty graphics display. This program uses player/missile graphics to draw a multicolored "snail" on your TV screen. The snail crawls along a line of RPM figures and changes color if your drive speed is outside the recommended range. The cute little snail is certain to delight small children — and how many disk utilities can make that claim?

Running the program.

After you've typed in and D:CHECKed the Snail program, save it on a disk. Then find an old formatted disk you don't care about, insert it into the drive you are testing and type RUN. After about three seconds your TV screen should look like this:



X = -

Figure 1.

S = +

Answer the "Drive Number?" prompt by typing 1, 2, 3 or 4 (no RETURN is necessary). The selected drive should start spinning and you will hear the steady beep-beep-beep of sectors being read. If the drive isn't connected properly, or the disk isn't formatted, or you type an illegal drive number, you'll get an error message along with a rude bleat from the console.

Soon the Snail will slide across your TV screen, dragging a white line along with him. When he stops, the pointer at the end of the line will indicate the average speed of your disk drive in revolutions per minute.

The optimum speed of an ATARI 810 Disk Drive is 288 RPM. As long as your drive speed remains near this value (285-290), the Snail will glow a healthy green. Faster or slower speeds will cause the Snail to turn red with anger.

To check another drive, or to abort the program, press the START key. Avoid touching the BREAK or SYSTEM RESET keys — these can cause the drive to spin helplessly until you turn off its power switch.

Adjusting your drive speed.

If the Snail is staying consistently "in the red," it's time to open up your drive and adjust the speed. The

adjustment is an easy and relatively safe operation as long as you take your time. To do it, you'll need a penknife or safety razor, a medium-sized Phillips head screwdriver and a small flat screwdriver.

Clean your work area thoroughly to avoid contaminating the drive mechanism. Then locate the four circular screw-hole covers on top of the 810 and carefully pry them out with the knife or razor. Use the Phillips head screwdriver to remove the four long retaining screws that hold the top cover in place. Gently lift the cover off the base of the drive and set it aside. Don't lose the screws!

You should now be looking into the raw, steaming guts of your 810. Avoid touching any of the wires or components inside the drive. And don't drop any foreign objects into the mechanism.

Your next task is to locate the potentiometer (knob) that controls the rotation speed of the drive. If you own a very early version of the 810, the speed potentiometer will be located near the back left side of the drive. It's a knurled plastic wheel, white or light blue in color, with a flat slot on the top (see Figure 2).

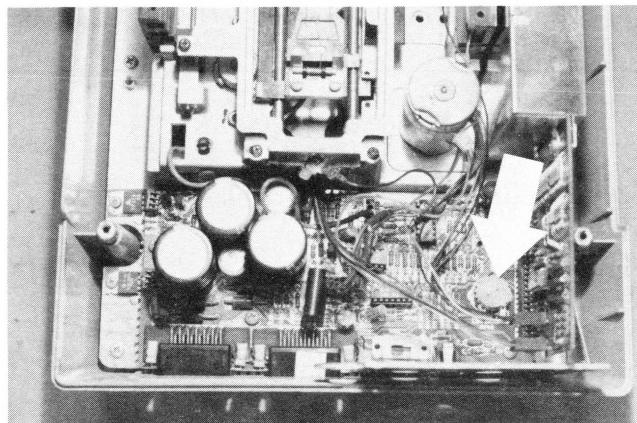


Figure 2.

In later versions of the 810, the speed control looks like a little green or blue box with a tiny screw on the top. You'll find it just left of center, a few inches away from the back of the drive (Figure 3).

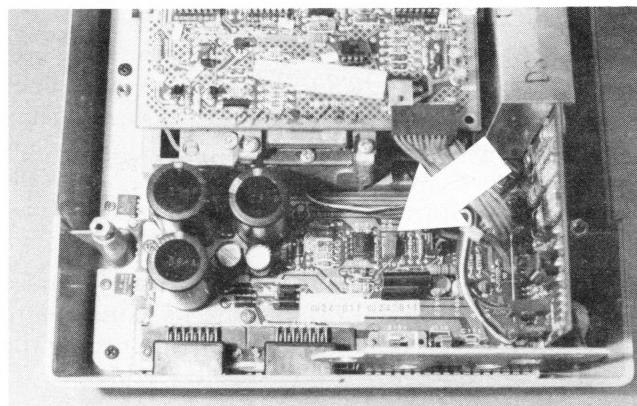


Figure 3.

Now you're ready to adjust the drive speed. Load the Snail program, insert a formatted disk into the opened drive and type RUN. Specify the proper drive number and wait for the snail to appear.

If your drive has a wheel-type speed control, carefully insert the end of your flat screwdriver into the slot on the wheel. Turn the wheel very slightly clockwise if the drive speed is too high (>290), or counter-clockwise if the speed is too low (<285). Be patient; let the snail stabilize after each new adjustment. By carefully tweaking the wheel back and forth, you should be able to make the snail hover around the 288 mark. Replace the drive cover (did you lose the screws?) and the job is finished.

If your drive has a box-type control, insert the end of the screwdriver into the tiny screw on top of the box (you may need a very small screwdriver to do this). Turn the screw counterclockwise if the drive speed is too high, or clockwise if the speed is too low. This is a multi-turn potentiometer, so it may take several complete turns to make a significant difference. Let the drive stabilize after each adjustment, and keep tweaking the screw until the snail hovers comfortably close to 288 RPM. Replace the drive cover and congratulate yourself for your cleverness. □

Program Variables

X, Q, I

General-purpose working variables.

W

Horizontal direction of the snail.

1=RIGHT, -1=LEFT.

$X = +$

$S = +$

$Z = L$

$C = J$

HNEW

The next horizontal position of the snail.

HOLD

The previous horizontal position.

PMPAGE

The first free memory page above the Snail program. Used to initialize player/missile graphics.

PMBASE

Absolute address of the first free byte in PMPAGE.

ML\$

This string holds the 72-byte machine language routine contained in the DATA statements on lines 330-350. ML\$ does 90% of the work in the Snail program; it sets up the built-in hardware timer, reads the disk sectors, stores the timer readings and adds them together for averaging.

TEST\$

This 4-byte string holds a tiny machine language routine (PLA, JMP \$E453) that checks to make sure the disk drive is actually working before testing the speed.

DUMMY\$

A 128-byte dummy buffer for the resident disk

handler. The address of this buffer is passed to the handler so that it won't overwrite anything important when it reads the disk.

WORK\$

Used to store the 32 timer readings obtained by the machine language routine in ML\$.

```

100 CLR :GRAPHICS 0:POKE 789,14:GOTO 2
00
110 X=USR(ADR(ML$),ADR(DUMMY$),ADR(WORK$)):IF X=0 THEN POKE 53248,0:POKE 532
49,0:POP :GOTO 100
120 Q=INT(3600/(X/32))-271:IF Q<3 THEN
Q=3
130 IF Q>35 THEN Q=35
140 W=1:HNEW=0*4+52:IF HNEW<HOLD THEN
W=-1
150 POKE 784,214:IF Q<14 OR Q>19 THEN
POKE 784,70
160 FOR I=HOLD TO HNEW STEP W:POKE 532
48,I:POKE 53249,I+8:NEXT I:HOLD=HNEW:P
OSITION 0,11:? "4";
170 FOR I=0-1 TO 0 STEP -1:POSITION I,
11:? CHR$(18):NEXT I:FOR I=0+1 TO 35
STEP 3:POSITION I,11:? " ";NEXT I
180 GOTO 110
190 REM * INITIALIZATION
200 DIM ML$(72),TEST$(4),DUMMY$(128),W
ORK$(32):PMPAGE=INT((PEEK(145)+3)/4)*4
:POKE 54279,PMPAGE
210 POKE 559,46:POKE 53277,3:PMBASE=PM
PAGE*256:FOR I=1 TO 72:READ B:ML$(I)=C
HR$(B):NEXT I:POKE 785,0
220 FOR I=PMBASE+570 TO PMBASE+574:REA
D B:POKE I,B:NEXT I:POKE 53248,24
230 FOR I=PMBASE+696 TO PMBASE+702:REA
D B:POKE I,B:NEXT I:POKE 53249,32
240 FOR I=1 TO 4:READ B:TESTS(I)=CHR$(C
B):NEXT I:POKE 752,1:POSITION 3,8:? "
SNAIL 1.0 Disk Drive Potentiometer"
250 POSITION 2,12:? " "
260 POSITION 3,13:? "275 280 285 29
0 295 300 305"
270 TRAP 270:OPEN #2,4,0,"K":POSITION
10,15:? "Which drive (1-4)? ff":GE
T #2,DRIVE:TRAP 40000
280 CLOSE #2:DRIVE=48:IF DRIVE<1
OR DRIVE>4 THEN 270
290 POKE 769,DRIVE:POKE 770,82:POKE 77
2,0:POKE 773,255:POKE 778,1:POKE 779,0
:HOLD=24
300 X=USR(ADR(TEST$)):IF PEEK(771)<>1
THEN POSITION 10,16:? "Disk access err
ff":GOTO 270
310 POSITION 10,15:? " Testing Drive #
";DRIVE:POSITION 6,16:? "Press START
to change drive":GOTO 110
320 REM * M/L ROUTINE
330 DATA 104,104,141,5,3,104,141,4,3,1
04,133,204,104,133,203,216,169,0,133,2
12,133,213,32,83,228
340 DATA 169,31,133,205,169,0,133,20,3
2,83,228,165,20,164,205,145,203,136,48
,10,132,205,173,31,208
350 DATA 201,6,208,231,96,160,31,24,17
7,203,101,212,133,212,144,2,230,213,13
6,16,242,96
360 REM * SHELL
370 DATA 12,30,63,127,255
380 REM * HEAD
390 DATA 160,64,64,64,192,192,192
400 REM * TEST ROUTINE
410 DATA 104,76,83,228

```



CHECKSUM DATA (See p.46)

```
100 DATA 301,803,247,738,491,76,258,53
,710,481,540,638,933,953,266,7488
250 DATA 364,924,671,812,503,714,488,8
99,810,971,11,120,95,827,773,8982
400 DATA 356,800,1156
```

```
0710 CLC
0720 LDA (POINTER),Y
0730 ADC BASIC
0740 STA BASIC
0750 BCC OKAY
0760 INC BASIC+1
0770 OKAY
0780 DEY
0790 BPL NEXTADD ; keep adding
0800 RTS ; give sum to BASIC
```

Assembly Language Listing

```
0100 ; SNAIL 1.0
0110 ; ATARI DISK DRIVE TACHOMETER
0120 ; (C)1983 ANALOG COMPUTING
0130
0140 ; SYNTAX: X=USR(ML,B1,B2)
0150 ; ML=addr of this routine
0160 ; B1=addr of dummy disk buffer
0170 ; B2=addr of 32-byte work buffer
0180
0190 ; Program equates
0200
0210 BASIC = $D4 ; BASIC return addr
0220 POINTER = $CB ; pointer to workbuffer
0230 TEMP = $CD ; temporary variable
0240 SYSTIM = $14 ; system jiffy timer
0250 CONSOLE = $D01F ; console key status
0260 DISKIO = $E453 ; disk handler entry
0270 DBUF = $0304 ; disk buffer addr
0280 ;
0290 PLA ; # arguments
0300 PLA ; msb of disk buffer addr
0310 STA DBUF+1
0320 PLA ; lsb
0330 STA DBUF
0340 PLA ; msb of work buffer addr
0350 STA POINTER+1
0360 PLA ; lsb
0370 STA POINTER
0380 CLD ; clear decimal mode
0390 LDA #$00
0400 STA BASIC
0410 STA BASIC+1 ; clear BASIC return
0420 JSR DISKIO ; bring drive up to speed!
0430 ;
0440 ; Read sector #1 32 times
0450 ;
0460 LDA #$1F
0470 STA TEMP ; initialize index
0480 AGAIN
0490 LDA #$00
0500 STA SYSTIM ; reset timer
0510 JSR DISKIO ; read sector
0520 LDA SYSTIM ; obtain access time
0530 LDY TEMP ; and index
0540 STA (POINTER),Y ; save in buffer
0550 DEY
0560 BMI SUM ; exit if buffer full
0570 STY TEMP ; otherwise update index
0580 LDA CONSOLE
0590 CMP #$06 ; START key pressed?
0600 BNE AGAIN ; no; get another sector
0610 RTS ; otherwise exit
0620 ;
0630 ; Add up the timer readings
0640
0650 ; BASIC return addr serves double duty
0660 ; as a temporary sum buffer
0670
0680 SUM
0690 LDY #$1F ; initialize index
0700 NEXTADD
```

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OUR GAME

by Joel Gluck

Psssst. Hey you. Yeah, you. C'mere. A little closer . . .

I know you. You're the person who has always wanted to write a video game. You know some BASIC, and maybe you've even tried your hand at a game or two, but for some reason it never quite worked out.

Maybe you got bored with your idea. May you were disappointed with the results you were getting. Maybe you didn't know enough BASIC or enough about your ATARI.

Well, let me tell you something. I know hundreds of people like you. Their hearts are in the right place, and most of them have some really good ideas. All they need is a little push . . .

The Idea

A while ago I was offered the opportunity to write a column for A.N.A.L.O.G. Never one to turn down a great chance, I said "sure."

The problem was that I needed an idea for the column. Managing Editor Jon Bell suggested a few things, and one of them really caught my fancy; a column for people who are interested in writing video games.

Given that starting point. I began to think about "the ultimate column." How about a column that didn't only talk about writing video games, but developed one over a series of articles? Why stop there? Why not let the readers participate? They could send in ideas about anything; the general plot of the game, graphic and sound effects, game options, what the game should be called, any aspect at all. It would be a total collaboration between myself and the readers.

That's the idea. That's why this column is called *Our Game*.

Good Games

What makes a good video game good? Well, there are many different kinds of video games, so to be more specific, we'll be talking more about arcade-style games, and not so much about adventures, or computer chess, or card games.

A video game, like any game, should be fun. How much fun, you say? Well, it should be more fun than just watching television. When you sit down at a TV set to relax, you have a choice you can either sit back and watch, or you can tune on your computer and play a game. A video game should be enjoyable enough to convince you to turn on the computer.

Another test of a good game is the "replayability factor." A game may be fun, but does it keep you up playing 'til the wee hours? Does it make you say: "Aw, just one more game . . .?"

A good video game should take "a minute to learn and a lifetime to master." It should have complexities, but not more than your average 10 year-old can handle — unless, of course, the game is meant for small children. It shouldn't be too difficult or too easy; it should allow the novice to play a satisfying game, yet keep the experienced player from feeling he's done it all.

Many decent arcade games are unsuccessful because a first-time player loses too quickly. A well-designed game leaves the player satisfied with his performance, so that he wants to play again.

I/O

Input/output usually refers to the flow of data into and out of a device or a program. In video games, it can describe how the player interacts with the game. The input is the means of playing the game: the joystick, paddle, keyboard, keypad, track-ball, light-pen, or whatever. Output is the way the game talks back to the player, usually through graphics and sound effects (although I'm sure someone is working on video games that you can smell.)

Good input should be simple and feel natural. Would *Space Invaders* be as good if you had to type F-I-R-E on a keyboard, rather than pushing a button? A more realistic example is *Missile Command*: Doesn't the track-ball in the arcade version feel much more natural than the joystick in the home version?

Good output is not easy to achieve. Both graphics and sound must be appealing and dynamic. More significantly, they must be integrated. What good are a whole bunch of weird sound effects if an alien makes no noise when it blows up?

Another point about graphics: While great art isn't necessary, it is nice to have a variety of shapes and colors. The same applies to sound; I'm not demanding Mozart, but how about a little victory tune or some other music thrown in at appropriate times?

Output reaches its climax in "the special effect." Every good video game should have at least one

impressive special effect. In *Defender*, it's the huge explosion; in *Star Raiders*, it's "going into hyperspace." Although not strictly necessary, a good special effect can turn an "eh" game into a "wow" game.

All good home computer games should have a fairly elaborate introduction and conclusion, and good arcade games should have an eye-catching "attract mode" (what the machine does when nobody is playing it). Computer games should have plenty of options to keep players interested; the options should be simple to choose and convenient to enter.

A good video game should also be easy and fast to replay; you shouldn't have to sit through the instructions or list of options again. Neither should the game itself be too long. Take *Eastern Front*: It's a great game, but it takes hours to play, and you can't save the game and come back to it later. That's poor design.

The subject matter of a game is also important. A game may have all the attributes mentioned above, but if it's concerned with stamp collecting, I'd hardly be compelled to play. Furthermore, it's possible that a game can be too violent, or objectionable in other ways. A game based on destroying people in wheelchairs might not go over too well.

Separating the Pac-Men From the Boys

I can sum up the crucial element of a good video game in one word: originality. Any competent programmer can write yet another version of *Asteroids*, but the real genius is that of the original author.

Of course, I don't insist on total originality. *Galaxians* was based on *Space Invaders*, yet made a significant contribution of new ideas. *Galaga*, on the other hand...

This is not to say I refuse to play unoriginal games. I merely frown upon them. When I see another rehash of *Frogger*, for example, I say to myself "Boy, what a waste of creative energy!" Nothing sells as well, or is quite as impressive, as a new, original game.

Your Move

That about sums up what makes a good game. Do you disagree? I'm sure I missed something. Please write and tell me what you think.

Not only that, if you have any ideas for the game we're going to write together in the coming months, I'd like to hear them. Any important or trivial thing, whether it be an entire plot or simply a name (although it's a bit premature for that) will be warmly received.

Send your ideas, questions, and contradictions to:

Our Game

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P.O. Box 23
Worcester, Mass. 01603

In most cases I won't be able to reply by mail, but I will try to include as much reader input as I can in future columns.

Next time we'll be discussing the steps for writing a video game, from the birth of the idea to the final touches. □

*In addition to slaving away full time as a student at MIT in Cambridge, Joel has written several programs for the ATARI Program Exchange including **Attank!**, **Babel**, and **fun-FORTH**.*

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by Brian Moriarty

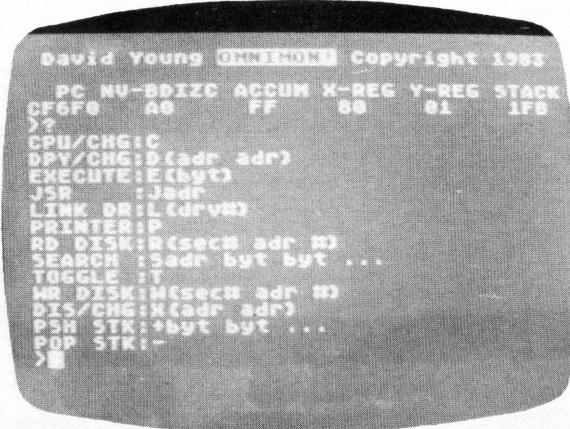
An advertising manager I know once joked that "today's product flaws are tomorrow's features." According to this definition, ATARI home computers are among the most feature-packed on the market. The 400/800 operating system in particular is full of quirky little "features" which 3rd-party suppliers have been successfully exploiting for years.

One of the most interesting flaws in the OS is the wasted 4K memory bank located at hex \$C000. OMNIMON!, a new hardware product from CDY Consulting, replaces this otherwise useless memory area with a powerful ROM-resident system monitor, similar to the one included as standard equipment on other popular micros such as the Apple II.

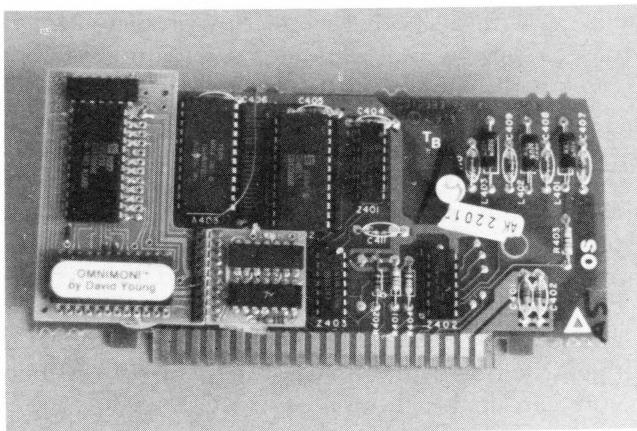
What it can do.

OMNIMON! is entered by pressing SYSTEM RESET while holding down either the OPTION or SELECT key. You can also activate it with a USR call out of BASIC, or by executing a JSR \$C001 instruction in machine language. Once "inside," you can examine, search, disassemble and alter memory locations, monitor the 6502 registers and hardware stack, read and write individual disk sectors and keep printed records of your work. Best of all, you can access these functions whenever the computer is turned on, regardless of what other software may be running (including a cartridge).

The screen photo shows the OMNIMON! title display and a menu of all available commands. The menu can be reviewed at any time by typing the "?" character, a thoughtful touch which typifies the friendliness of the system. All of the most-needed monitoring and debugging functions are available. Many are reminiscent of those included in the ATARI Assembler/Editor cartridge.



The disk I/O commands are the most interesting part of the OMNIMON! system. They allow you to read any specified range of disk sectors into RAM, using either the 128 byte/sector boot format or the 125-byte/sector DOS format — in either single or double density mode! This means you can load and execute binary DOS files without using a DOS. OMNIMON! also lets you convert DOS files to boot files and vice-versa, a capability found only in the most expensive software-based disk management programs. Other possibilities include dumping any block of RAM, OS or cartridge ROM out to a disk and moving it back into RAM anywhere you like.



OMNIMON! checks the syntax of all user inputs and reverts to reasonable defaults if no parameters are specified. All of the ATARI's built-in screen editing functions are supported; you can use the "T" (Toggle) command to enter data in either hexadecimal or ATASCII characters.

Installation

It took less than five minutes to get OMNIMON! up and running on the 800 system in my office. First you pop open the lid, pull out the personality board in Slot #1 and discard its plastic cover. Then you pull out one of the OS ROM chips and plug the L-shaped OMNIMON! board directly into the empty socket. Solder a single jumper into place, replace the OS chip and personality board and you're ready to go. OMNIMON'S 16 page user's guide includes complete installation instructions for both the ATARI 800 and 400 computers. It cannot be used with the 1200XL system.

Compatibility.

The OMNIMON! board has behaved itself fairly well in the several weeks since I installed it. It appears to be fully compatible with all of the ATARI programming environments I tested, including the BASIC and Assembler/Editor cartridges, Microsoft BASIC, the ATARI Macro Assembler, OSS BASIC A+ and MAC/65, the ABC BASIC compiler and valFORTH.

I did run into trouble with a couple of copy-protected game disks. For instance, my review copy of *Pinhead* by Utopia Software refuses to boot properly on my modified 800; instead of initializing the game, the system makes a gurgling noise and jumps into OMNIMON!. A similar thing happens when I try to use *Disked* by Amulet Enterprises. Every time I answer a sector number prompt, the system drops out of BASIC and into OMNIMON!.

It's hard to say whether this behavior is being caused by the OMNIMON! board or by the offending software itself. The rarity of the phenomenon suggests that the programs are making illegal entries into the ATARI's resident disk handler, thereby interfering with OMNIMON!'s hooks into the operating system. This is similar to the problem owners of the new Apple IIe system are having with disks that were copy-protected for the older Apple II and II+ systems. The moral in both cases is the same: Avoid non-standard OS calls!

OMNIMON! can be a great addition to your ATARI computer if you know what to do with it. The ability to "freeze" a running program on-the-fly and examine the hardware registers is invaluable for testing and debugging; the sector-level disk functions are alone worth the price of the board. If you do lots of machine-language programming and know which end of the soldering iron to hold, OMNIMON! might be one of the smartest hardware investments you can make. Look for it at your local CDY dealer. □

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The MONKEY WRENCH provides 18 direct mode commands. They are: AUTO LINE NUMBERING — Provides new line numbers when entering BASIC program lines. RENUMBER — Renumerates BASIC's line numbers including internal references. DELETE LINE NUMBERS — Removes a range BASIC line numbers.

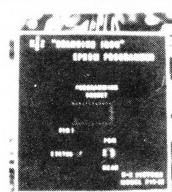
VARIABLES — Display all BASIC variables and their current value. Scrolling — Use the START & SELECT keys to display BASIC lines automatically. Scroll up or down BASIC program. FIND STRING — Find every occurrence of a string. XCHANGE STRING — Find every occurrence of a string and replace it with another string. MOVE LINES — Move lines from one part of program to another part of program. COPY LINES — Copy lines from one part of program to another part of program. FORMATTED LIST — Print BASIC program in special line format and automatic page numbering. DISK DIRECTORY — Display Disk Directory. CHANGE MARGINS — Provides the capability to easily change the screen margins. MEMORY TEST — Provides the capability to test RAM memory. CURSOR EXCHANGE — Allows usage of the cursor keys without holding down the CTRL key. UPPER CASE LOCK — Keeps the computer in the upper case character set. HEX CONVERSION — Converts a hexadecimal number to a decimal number. DECIMAL CONVERSION — Converts a decimal number to a hexadecimal number. MONITOR — Enter the machine language monitor.

In addition to the BASIC commands, the Monkey Wrench also contains a machine language monitor with 16 commands used to interact with the powerful features of the 6502 microprocessor.



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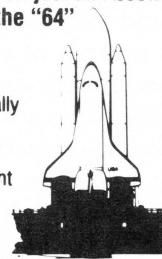
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A WARNING TO 1200XL OWNERS

If you own an ATARI 1200XL and typed in **Adventure in the 5th Dimension** from our last issue, you were in for a rude shock. The 1200XL operating system contains an insidious little bug which crashes the adventure every time you try to RUN it.

Unlike the ATARI 400 and 800 systems, the 1200XL is very picky about PRINTing to an OPENed screen device, especially when you're in a "forced" split-screen mode. The entire screen goes wacky if your PRINT statement makes the cursor enter the bottom text window. Try it yourself!

```
10 GRAPHICS 0
11 REM * Open the screen device (5:)
12 OPEN #2,8,0,"5:"
13 REM * Invoke forced split-screen
14 POKE 703,4
15 REM * Cursor to bottom of window
16 POSITION 39,19
17 REM * Print to the window
18 PRINT #2;"COMPATIBILITY"
```

Fortunately, the adventure program violates this undocumented restriction only once, in line 12. Since the purpose of line 12 is purely cosmetic (it puts a fancy white border across the top of the response window), the simplest way to deal with it is to eliminate it altogether.

We apologize for not discovering this problem before **The 5th Dimension** went to press. Please let us know about any other compatibility problems you may discover in the 1200XL systems.

Necromancy

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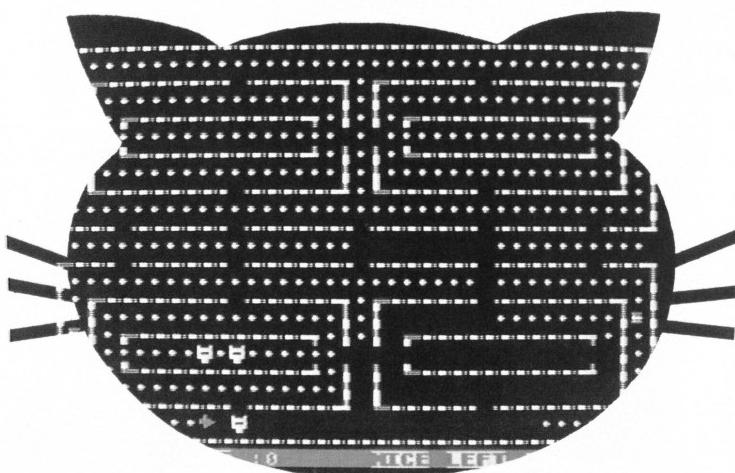
THE ATARI's FOUR COLOR CHARACTER SETS

16K cassette or 24 K disk

by Dave Plotkin

The ATARI's ability to exploit redefined character sets is fairly well known to most users. Beginners may wonder why we bother with redefined character sets at all. After all, it's a lot of trouble (well, not really, but more trouble than PLOT and DRAWTO). You have to redefine each character either by hand (Heaven forbid!) or, more likely, using one of the many programs available for this purpose. Then you have to download the ROM character set into RAM, and modify the values of the bytes representing the letters which we want to change the shape of. While the step-by-step procedure for accomplishing this is amply documented elsewhere and is beyond the scope of this article, you can look at the program listing starting at line 32000 to see how it's done. The answer to why we bother is that the text modes are very powerful. Animation can be accomplished by simply printing characters to the screen. This is much faster than erasing and redrawing using PLOT and DRAWTO. It's also very easy to keep score right on the screen, since you are in a text mode. And, text modes take much less memory than the corresponding resolution graphic mode.

The limitation of using redefined character sets in GR.1 and 2 is that although five colors are available at once, each character can be only one color. You CAN get multi-color characters by artifacating a GR.0 character set. This is because each pixel in a GR.0 character is the same size as the pixels in GR. mode 8. A multitude of articles on artifacating GR.8 have appeared recently. Any of the methods of selectively placing pixels to obtain color that works in GR.8 will work when you redefine the GR.0 character set. You do lose half your horizontal resolution (plotting every other pixel), but more importantly, you lose your color indirection. Color indirection is the ability to change the value in a color register (using SETCOLOR) and have all the pixels



on the screen plotted in that COLOR change to the new color. The colors generated using a redefined GR.0 character set (and GR.8) depend primarily on the background color, not on the values in the color registers.

Obviously, then, what we'd like to have is a character set of fairly high resolution (say, equivalent to GR.7) in which each character could be multicolored and redefinable. Your ATARI contains just such a set — in fact, two such sets — but they are a little hidden and you have to know where to look and how to call them. The first clue to the existence of the "hidden" character sets comes from study of the instruction set for the graphics chip in your ATARI known as "Antic." This instruction set is a set of numbers which tell Antic how to display the screen — which lines on the screen are to be in which graphics mode. A series of numbers chosen from the instruction set define the whole screen. This series is known as the Display List. Each time you issue the GRAPHICS N command, BASIC constructs a Display List for you to define the screen. Again, the full treatment of Display Lists is well beyond the scope of this article. For example, if the Display List contains a 2, Antic will put a line of GR.0 on the screen. Similarly, a 6 will tell Antic to put a line of GR.1 on the screen. But what happened to 3, 4 and 5?? Aha!! Antic modes 3, 4 and 5, also known as the Antic Instruction Registers (IR) are the three "hidden" sets. They are, of course, not hidden at all, but you can't call them from BASIC with a GRAPHICS N command. You have to construct the display list yourself, which CAN be done from BASIC.

We are going to concentrate on IR modes 4 and 5. IR mode 3 is a twist on GR.0 with some changes to accomodate lower case descenders. But IR modes 4 and 5 are 4 color character sets. These sets can add quite a lot of pizzaz to your programs. IR mode 4

characters are the same size as GR.0 characters, while IR mode 5 characters are twice as tall. The similarity in size between IR mode 4 and GR.0 characters presents the powerful possibility of designing and debugging a game entirely in GR.0 and only converting over to IR mode 4 after it is running (that's how CAT and MOUSE was written). One more note before proceeding into how to put IR modes 4 and 5 on YOUR screen. The normal ROM character set in you ATARI is almost unreadable in these modes. So if you want to do any scoring on the screen you'll either have to redefine the numbers so that they are readable, or better, leave a portion of the screen in GR.0, 1 or 2 so that scoring and information is readable on these lines. In CAT and MOUSE I left the very last line on the screen as GR.0.

The first step to setting up IR modes 4 and 5 is to call:

10 GRAPHICS 0

Then you have to find our where the Display List is in memory. The ATARI maintains a pointer in memory at locations 560(low byte) and 561(high byte). The pointer tells you where the Display List is. So the next statement is:

20 DL=PEEK(560)+PEEK(561)*256

Finally, you have to poke the correct values into the Display List to generate the screen you want. For IR mode 4:

```
30 POKE DL+3,68:REM 68=64+IR MODE (4)
40 FOR A=6 TO 28:POKE DL+A,4:NEXT A
```

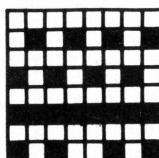
and for IR mode 5:

```
30 POKE DL+3,69
40 FOR A=6 TO 16:POKE DL+A,5:NEXT A
50 POKE DL+17,65:POKE DL+18,PEEK(560):
POKE DL+19,PEEK(561)
```

Line 50 is not necessary for the IR mode 4 Display List because the Display List for IR mode 4 is the same size (same number of lines on the screen) as the GR.0 Display List it replaces. The numbers POKEd in line 50 finish every Display List by telling Antic where to go back to find the beginning of the list. Since IR mode 4 and GR.0 have the same number of lines, the numbers in line 50 already finish the IR mode 4 Display List, they were put there when you called GR.0. But IR mode 5 characters are twice as tall, so there are fewer lines on the screen, and thus a shorter Display List. You therefore have to finish the Display List by putting in the necessary last line that tells Antic "all done, start over." Recall that if you decide to customize your display further by putting some lines of normal text on the screen, you have to follow the rules about total number of scan lines

adding up to 192 (see COMPUTE's First Book of ATARI, "Designing your own ATARI Graphics Modes," by A.N.A.L.O.G. technical advisor Craig Patchett). Lines of GR.0 or 1 on an IR mode 4 screen are no problem, as they are the same height as IR mode 4. The same thing is true for lines of GR.2 on an IR mode 5 screen.

To specify the color of each pixel in the IR mode 4 and 5 characters is simple, although getting pleasing shapes and colors takes some experimentation. As you may already know, each letter is normally 8 columns (or pixels) wide. IR modes 4 and 5 break up the 8 columns of pixels into 4 columns of 2 pixels each. This reduces the horizontal resolution from the equivalent of GR.8 to the equivalent of GR.7. The color of each GR.7-sized block is determined by the way in which the 2 pixels in each group are lit. When neither pixel is lit, you get background color, register 4 (SETCOLOR 4). When only the right pixel is on, you get the color in register 0 (SETCOLOR 0). When only the left pixel is one, you get the color in register 1 (SETCOLOR 1). And when both the left and right pixels are on, you get the color in register 2 for regular letters and the color in register 3 for inverse letters. IR modes support inverse. The sketch below shows the enlarged layout of possible pixel patterns and the generated color. Note that the way the colors are defined is identical to how GR.7 defines its colors. Note also that IR mode 5 has the same horizontal and vertical resolution as GR.7, but IR mode 4 has the horizontal resolution of GR.7 and the vertical resolution of GR.8. You may wonder — is there a graphics mode with this same resolution? Yes there is, but you have to adjust a GR.8 Display List to get it...



No Pixels Lit: Background color
 Right Pixel Lit: Color 1 (setcolor 0)
 Left Pixel Lit: Color 2 (setcolor 1)
 Both Pixels Lit: Color 3 or 4 (inverse)
 Mixed: Left half color 2, right half color 1

As you can probably imagine, a fair amount of trial and error is necessary to get just the right shapes and color combinations, so plotting by hand and trying out the results in a program is pretty forbidding. Let me suggest therefore, that you pick up a copy of Sheldon Leemon's "INSTEDIT," one of the finest and most versatile character editors I've ever run across. It's available from the ATARI Program Exchange.

The game CAT and MOUSE is included to show you the versatility of IR modes 4 and 5. Note that there are no Player/Missile Graphics, no fancy screen PEEKs and POKEs, not even any machine



DISKEY

by Sparky Starks

Potential into practical reality. This is the core of DISKEY — a remarkable utility program that gives ATARI disk drive owners the flexibility to accomplish tasks that other utilities either ignored or only hinted at. With DISKEY, the user will be able to actually examine a disk and its directory, and repair some files that might otherwise have been lost. DISKEY also performs a multitude of other practical functions, including the following:

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- C Copy sectors, OD to DD, OS to DS
- D Toggle destination drive
- E Erase disk (format)
- F Select file sub-menu
- L Set automatic function lower limit (OS)
- M Modify Sector Map
- N New destination sector
- O Toggle originate drive
- P Print screen to printer
- Q Query (search for hex key, drive OD, sector OS to DS)
- R Read new OS, set DS to match
- S Search for ASCII key, drive OD, sector OS to DS
- T Tape to disk
- U Upper case conversion of printer lower case
- V Toggle write verify
- W Write memory buffer to sector DS, drive DD
- X Select EOR Sector Map screen print mask
- Z Zero memory buffer
- + Read upward, next sector on disk
- Read downward
- ? Directory information
- ! Select directory sub-menu
- cB Byte compare, D1 to D2, whole disk
- cC Copy D1 to D2, whole disk
- cD Decimal to hex, ASCII conversion
- cE Erase disk (without new format)
- cF Modify sector forward sector chain reference
- cH Hex to decimal, ASCII conversion
- cL Locate bad sector on drive OD
- cN Modify sector file number reference
- cO Select one-drive functions sub-program
- cP Print current Disk Map
- cR RPM test drive OD
- cS Special file copy, no directory reference from source
- cV VTOC update and repair, drive OD
- cY Toggle Sure Response prompt enable
- fA File binary load address headers to printer
- fD Delete file
- fF Select filename for all file functions
- fL Lock file
- fM Show memory address load position in file
- fQ Relative Query
- fR Rename file
- fS Relative Search

BASIC ROUTINES FOR THE ATARI

by Jerry White

Finally, a self-help system that cuts through the stuffy technical jargon and allows the user to learn effective programming techniques fast! BASIC ROUTINES FOR THE ATARI has been written especially for ATARI 400 or 800 users who wish to write programs in BASIC. This package comes complete with an extensive manual and your choice of a tape or disk which contains all of the routines from the manual — which means you'll be able to actually see each of them in action on your ATARI. Some of the BASIC routines include joystick, sound, player missile strings and much more — and presented in a way that you'll quickly be able to learn and apply to your own programs.

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language (except to download the character set, and I didn't write that, Alan Zett did). The game runs fairly quickly. I did make some concessions to BASIC's lack of speed, however. The sound is very simple, the strategy of the cats extremely single-minded, and the score is updated infrequently. Once you get the strategy, however, I think you'll find it fun to play. Couple of hints to get you started — the cats won't follow you past the edge of the screen, and if you keep a wall between your mouse and the cats, they just won't know what to do!

CAT AND MOUSE is a maze game. You control the mouse with your joystick. The object is to go around the maze, eating bits of cheese. You are diligently chased by three cats who will tenaciously follow you wherever you go. The mouse and cats travel at the same speed, so don't make any mistakes! At four points around the maze are large cheeses that allow your mouse to eat the cats for a while, getting extra points. When you eat the big cheese, the cats change color. A short warning tone tells you when the cats are about to change back to normal. Each new cat emerges from the center of the maze. They will not emerge when you are at the center, so don't worry. One of the nice features of the graphics is the moving walls of the maze. By merely exchanging the contents of two color registers, the walls appear to move. This same effect rotates the cat colors, changes the eyes of the scared cats from white to red and back again, animates the bits of cheese, and flashes the score on the bottom of the screen. Isn't color indirection wonderful?

DOCUMENTATION:

GAME VARIABLES —

TEMP — holds color register 0 (708)

Z1, Z — LOCATE variables

X,Y-coordinates of the mouse

ST — value of the joystick

XS,YS — offset of mouse

XN,YN — new coordinates of mouse

T — number of dots eaten

P,R,L — loop variables

SC — score

A(L) — status of cat; 0 then cat on board

AX(L), AY(L) — coordinates of cats

TEMpx, TEMPY — temporary coordinates of cat

DIRX, DIRY — direction cat is to move

FL(L), Z1(L) — keeps track of what is under the cats (like a cheese)

Q — counts down time till cats change back

CR — number of mice left

LINE DOCUMENTATION —

100 Rotates the screen colors

110 Check to see if mouse eats cats

120 Reads joystick

130 — 200 Move mouse, test for cheese eaten, keep

score, test for eating the big cheese.

210 — 350 Logic for moving cats

500 — 560 Routine for mouse getting eaten

600 — 640 Routine for mouse eating the cats

700 — 720 Change the cats

900 — 930 End of game routine

1000 — 1040 Initializing routine to modify the display list.

1100 — 1350 Draw the board

32000 — 32111 Redefine the character set

```

1 PRINT CHR$(125); "INITIALIZING...": GO
SUB 32000:CLR :GOSUB 1000
90 POKE 53762,100
100 TEMP=PEEK(708):POKE 708,PEEK(709):
POKE 709,TEMP:LOCATE X,Y,Z:IF Z=27 THE
N GOTO 500
110 IF Z=16 THEN COLOR 64:PLOT X,Y:GOS
UB 600
120 POKE 53761,136:ST=STICK(0):X5=(ST=
7)-(ST=11):YS=(ST=13 OR ST=5 OR ST=9)-
(ST=14 OR ST=6 OR ST=10)
130 XN=X+X5:YN=Y+YS:IF XN>38 THEN XN=1
140 IF XN<1 THEN XN=38
150 POKE 53761,0:LOCATE XN,YN,Z:IF (Z=
17 OR Z=26 OR Z=5 OR Z=3 OR Z=18 OR Z=
124) THEN GOTO 210
160 IF Z=27 THEN COLOR 32:PLOT X,Y:GOT
0 500
170 IF Z=16 THEN COLOR 32:PLOT X,Y:X=X
N:Y=YN:COLOR 64:PLOT X,Y:GOSUB 600:GOT
0 210
180 IF Z=46 THEN T=T+1:SC=SC+10:GOTO 2
00
190 IF Z=9 THEN SC=SC+50:GOSUB 700
200 COLOR 32:PLOT X,Y:X=XN:Y=YN:COLOR
64:PLOT X,Y:IF T=418 THEN 800
210 FOR L=1 TO 3:LOCATE 19,11,Z1
220 IF A(L)=0 AND Z1=32 THEN IF INT(RN
D(0)*10)=0 THEN COLOR 27:AX(L)=19:AY(L
)=11:PLOT AX(L),AY(L):A(L)=1:GOTO 310
230 IF A(L)=0 THEN GOTO 310
240 LOCATE AX(L),AY(L),A
250 TEMpx=AX(L):TEMPy=AY(L):DIRx=SGN(X-
AX(L)):LOCATE AX(L)+DIRx,AY(L),Z1
260 IF (Z1=32 OR Z1=64 OR Z1=46 OR Z1=
9) THEN FL(L)=Z1(L):Z1(L)=Z1:AX(L)=AX(
L)+DIRx:GOTO 295
270 DIRy=SGN(Y-AY(L)):LOCATE AX(L),AY(
L)+DIRy,Z1
280 IF (Z1=32 OR Z1=64 OR Z1=46 OR Z1=
9) THEN FL(L)=Z1(L):Z1(L)=Z1:AY(L)=AY(
L)+DIRy:GOTO 295
290 GOTO 310
295 IF FL(L)=64 THEN FL(L)=32
300 COLOR FL(L):PLOT TEMpx,TEMPy:COLOR
A:PLOT AX(L),AY(L)
310 NEXT L:IF Q=0 THEN GOTO 100
320 Q=0-1:IF Q=5 THEN FOR B=1 TO 25:50
UND 0,150,10,8:NEXT B:SOUND 0,0,0,0
325 IF Q>1 THEN GOTO 100
330 COLOR 27:FOR R=1 TO 3:IF A(R)=0 TH
EN GOTO 350
340 PLOT AX(R),AY(R)
350 NEXT R:GOTO 100
500 FOR P=1 TO 5:FOR M=1 TO 30:SOUND 0
,30,10,8:NEXT M
510 FOR M=1 TO 30:SOUND 0,50,10,8:NEXT
M:NEXT P:SOUND 0,0,0,0
520 Q=0:CR=CR-1:IF CR=0 THEN GOTO 900
530 FOR L=1 TO 3:IF A(L)=0 THEN GOTO 5
50
540 COLOR Z1(L):PLOT AX(L),AY(L):AX(L
)=0:AY(L)=0:A(L)=0:FL(L)=32:Z1(L)=32
550 NEXT L:COLOR 32:PLOT X,Y
555 POSITION 13,23:? SC:POSITION 30,2
3:? CR;
560 COLOR 64:X=19:Y=11:PLOT X,Y:GOTO 1
00
600 FOR P=1 TO 3:FOR M=1 TO 30:SOUND 0
,40,10,8:NEXT M:NEXT P

```

```

610 FOR W=1 TO 70: SOUND 0,30,10,8:NEXT
W:FOR W=1 TO 30: SOUND 0,40,10,8:NEXT
W
620 FOR W=1 TO 60: SOUND 0,30,10,8:NEXT
W: SOUND 0,0,0,0
630 FOR L=1 TO 3: IF AX(L)=X AND AY(L)=
Y THEN A(L)=0
640 NEXT L: SC=SC+200: POSITION 13,23:?
SC: :RETURN
700 Q=70: COLOR 16: FOR L=1 TO 3: IF A(L)
=0 THEN GOTO 720
710 PLOT AX(L),AY(L)
720 NEXT L: FOR W=1 TO 25: SOUND 0,W,X,1
0,8:NEXT W: SOUND 0,0,0,0: RETURN
800 FOR P=1 TO 4: FOR W=1 TO 30: SOUND 0
,35,10,8:NEXT W:NEXT P
810 FOR W=1 TO 70: SOUND 0,100,10,8:NEX
T W: SOUND 0,0,0,0: SC=SC+500
820 PRINT CHR$(125): T=8: GOSUB 1030: GOT
0 100
900 GRAPHICS 17: POSITION 0,5: PRINT #6:
" YOU HAVE BEEN": PRINT #6; " ME
CHECKED": PRINT #6; " FINAL SCORE"
910 PRINT #6; " "/SC;" points.": PRIN
T #6;" to play": PRINT #6; " Again
Press fire"
920 IF STRIG(0)=1 THEN GOTO 920
930 GOSUB 1010: GOTO 100
1000 DIM A(5), AX(5), AY(5), Z1(5), FL(5)
1010 CR=3: SC=0: T=0
1020 GRAPHICS 0: POKE 752, 1: POKE 756, PE
EK(106)+1: POKE 708, 36: POKE 709, 200
1030 FOR L=1 TO 3: A(L)=0: AX(L)=0: AY(L)
=0: Z1(L)=32: FL(L)=32: NEXT L: Q=0
1040 DL=PEEK(560)+256*PEEK(561): POKE D
L+3, 68: FOR MM=6 TO 27: POKE DL+MM, 4: NEX
T MM
1100 COLOR 46
1110 FOR X=1 TO 37: FOR Y=1 TO 21: PLOT
X,Y: NEXT Y: NEXT X
1120 COLOR 17: PLOT 0,0: PLOT 0,12: PLOT
2,2: PLOT 2,14: PLOT 4,4: PLOT 4,16
1130 PLOT 20,2: PLOT 20,14: PLOT 22,4: PL
OT 22,16
1140 COLOR 26: PLOT 4,6: PLOT 2,8: PLOT 9
,10: PLOT 4,18: PLOT 2,20: PLOT 0,22
1150 PLOT 22,6: PLOT 20,8: PLOT 22,18: PL
OT 20,20
1160 COLOR 5: PLOT 18,2: PLOT 16,4: PLOT
18,14: PLOT 16,16: PLOT 38,0: PLOT 36,2
1170 PLOT 34,4: PLOT 38,12: PLOT 36,14: P
LOT 34,16
1180 COLOR 3: PLOT 16,6: PLOT 18,8: PLOT
16,18: PLOT 18,20: PLOT 34,6: PLOT 36,8
1190 PLOT 38,10: PLOT 34,18: PLOT 36,20:
PLOT 38,22
1200 COLOR 18: PLOT 1,0: DRAWTO 37,0: PLO
T 3,2: DRAWTO 17,2: PLOT 21,2: DRAWTO 35,
2
1210 PLOT 3,8: DRAWTO 17,8: PLOT 21,8: DR
AWTO 35,8
1220 PLOT 5,4: DRAWTO 15,4: PLOT 23,4: DR
AWTO 33,4: PLOT 5,6: DRAWTO 15,6
1230 PLOT 23,6: DRAWTO 33,6: PLOT 1,10: D
RAWTO 37,10: PLOT 1,12: DRAWTO 37,12
1240 PLOT 3,14: DRAWTO 17,14: PLOT 21,14
:DRAWTO 35,14: PLOT 5,16: DRAWTO 15,16
1250 PLOT 23,16: DRAWTO 33,16: PLOT 5,18
:DRAWTO 15,18: PLOT 23,18: DRAWTO 33,18
1260 PLOT 3,20: DRAWTO 17,20: PLOT 21,20
:DRAWTO 35,20: PLOT 1,22: DRAWTO 37,22
1270 COLOR 124: PLOT 0,1: DRAWTO 0,9: PLO
T 0,13: DRAWTO 0,21: PLOT 2,3: DRAWTO 2,7
1280 PLOT 2,15: DRAWTO 2,19: PLOT 18,3: D
RAWTO 18,7: PLOT 18,15: DRAWTO 18,19
1290 PLOT 20,3: DRAWTO 20,7: PLOT 20,15:
DRAWTO 20,19: PLOT 36,3: DRAWTO 36,7
1300 PLOT 36,15: DRAWTO 36,19: PLOT 38,1
:DRAWTO 38,9: PLOT 38,13: DRAWTO 38,21
1310 COLOR 32: PLOT 11,2: PLOT 27,2: PLOT
18,5: PLOT 20,5
1320 PLOT 11,8: PLOT 22,8: PLOT 4,10: PLO
T 11,10: PLOT 19,10: PLOT 27,10: PLOT 34,
10
1330 PLOT 4,12: PLOT 11,12: PLOT 19,12: P
LOT 27,12: PLOT 34,12
1340 PLOT 11,14: PLOT 27,14: PLOT 18,17:
PLOT 20,17: PLOT 11,20: PLOT 27,20

```

```

1350 COLOR 9: PLOT 1,4: PLOT 1,16: PLOT 3
7,4: PLOT 37,15
1355 POSITION 6,23: ? "SCORE": SC: POS
ITION 20,23: ? "NICE LEFT": CR
1360 COLOR 64: X=19: Y=11: PLOT X,Y: RETUR
N
32000 POKE 106, PEEK(106)-5: GRAPHICS 0:
START=(PEEK(106)+1)*256: POKE 756, START
/256: POKE 752, 1
32010 DIM XFR$(38): XFR$="H0VTCMCLWZJ
+iWLVWPKHEWHLKHNDEH*"
32020 Z=USR(ADR(XFR$)): RESTORE 32100
32030 READ X: IF X=-1 THEN RESTORE :RET
URN
32040 FOR Y=0 TO 7: READ Z: POKE X+Y+STA
RT, Z: NEXT Y: GOTO 32030
32100 DATA 112,0,0,20,48,20,0,0,0
32101 DATA 256,48,48,252,255,60,48,0,0
32102 DATA 536,20,20,20,168,168,0,0,0
32103 DATA 552,0,0,168,168,20,20,20
32104 DATA 584,0,252,84,168,84,252,0,0
32105 DATA 640,195,255,255,235,255,255
,60,60
32106 DATA 648,0,0,0,21,21,40,40,40
32107 DATA 656,0,0,0,90,90,0,0,0
32108 DATA 992,20,20,20,40,40,40,40,40
32109 DATA 720,40,40,40,21,21,0,0,0
32110 DATA 728,130,170,170,130,170,170
,40,40
32111 DATA -1

```

●

CHECKSUM DATA (See p.46)

```

1 DATA 959,46,879,679,486,167,120,721,
844,965,286,632,17,989,619,8409
230 DATA 394,1,785,113,385,124,719,655
,6,223,136,127,283,772,854,5577
500 DATA 655,911,930,133,276,151,950,5
16,663,648,717,214,692,734,747,8937
720 DATA 179,682,913,579,121,991,193,8
78,251,413,653,398,915,992,420,8488
1120 DATA 837,689,624,792,47,667,84,86
9,572,896,473,884,219,314,184,8151
1270 DATA 782,33,900,41,472,468,177,65
1,707,844,492,284,803,768,663,8005
32040 DATA 960,557,62,179,144,63,662,7
23,420,34,705,606,827,5962

```

●

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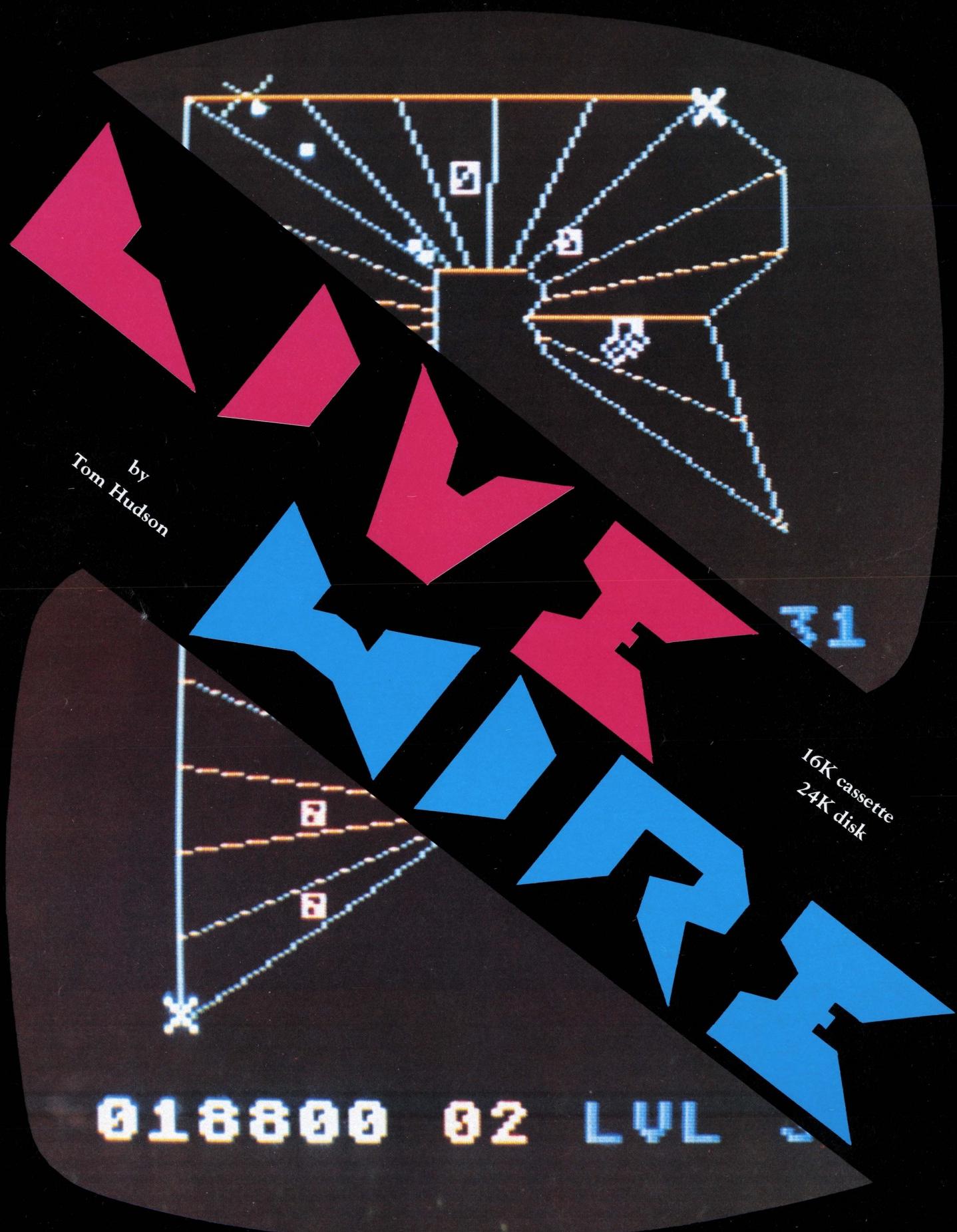
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Before I start, I would like to thank all the readers who wrote letters to A.N.A.L.O.G. about my last assembly-language game, **Fill 'Er Up!** Your kind remarks certainly made all the hard work worthwhile. It is also gratifying to see all the reader-submitted modifications to the program. This is why A.N.A.L.O.G. contains assembly-language source code listings whenever possible — to challenge readers to go beyond what they read, and in the process, learn more about their computers.

This brings me to an important point: Even though A.N.A.L.O.G. prints commented assembly source code, space does not permit a complete discussion of a program's inner workings. In order to do this, a documentation package similar to APX's **Source Code for Eastern Front (1941)** would be needed. In such a package, the program author would provide in-depth documentation, memory maps, and so on.

If enough interest is shown, A.N.A.L.O.G. will publish a detailed documentation package for selected feature programs. If you would be interested in seeing such packages, just drop a postcard in the mail to me here at A.N.A.L.O.G. I welcome any comments or suggestions, such as the inclusion of the source files on a diskette, etc. There's no obligation, of course — we'd just like to hear your opinions.

So much for introductions. Let's get on to this issue's public-domain game program, **Livewire!**

Typing the program.

Before you go hacking away at your keyboard, let's take a quick look at the listings accompanying this article.

LISTING 1 is the main data and data checking routine. This listing is used to create both the disk and cassette versions of **Livewire!**. As with **Fill 'Er Up!**, the data statements are listed in hexadecimal (base 16) to allow it to run in a 16K cassette system. It's a necessary evil.

LISTING 2 should be added to LISTING 1 if you are using a 410 cassette recorder.

LISTING 3 should be added to LISTING 1 if you are using a disk drive.

LISTING 4 is the assembly-language source code for **Livewire!**, created with the ATARI Macro Assembler. **You DO NOT have to type in LISTING 4 to play the game!** It is provided for those readers interested in seeing how the program works.

Follow the instructions below to make either a cassette or disk version of **Livewire!**.

Cassette Instructions

- Type LISTING 1 into your computer. If you have C:CHECK (Issue 11), use it to verify your typing. This will save headaches later.

- After LISTING 1 has been correctly typed into your computer, type in LISTING 2. The program

lines will automatically merge with LISTING 1. Make sure these lines were typed correctly. It's a good idea to CSAVE the entire program at this point.

- Type RUN and press RETURN. The program will begin checking the DATA lines, printing the line number as it checks each one. It will alert you if it finds any problems. Fix incorrect lines and re-RUN the program if necessary until all errors are eliminated.

- When all the data lines are correct, the program will ask you to "READY TAPE AND PRESS RETURN." Place a blank tape in your recorder, press RECORD and PLAY simultaneously and press RETURN. The message "WRITING FILE" will appear and the program will create a boot tape version of **Livewire!**, printing each data line number as it goes. When the READY prompt reappears, you're ready to load the game. Make sure your BASIC program has been CSAVEd before continuing.

- To play **Livewire!**, rewind the tape created by the BASIC program to the beginning. Turn your computer OFF and remove any cartridges. Press PLAY on your recorder, then turn your computer ON while holding down the START key. The computer will BEEP once. Press RETURN and **Livewire!** will load and run automatically.

Disk Instructions

- Type LISTING 1 into your computer. If you have D:CHECK II (Issue 10), use it to verify your typing.

- After LISTING 1 is correctly typed into your computer, type in LISTING 3. The lines will automatically merge with LISTING 1. It's a good idea to SAVE the entire BASIC program after you're done typing.

- Type RUN and press RETURN. The program will begin verifying the DATA lines, printing the line number as it checks each one. It will alert you if it finds any problems. Fix incorrect lines and re-RUN the program if necessary until all errors are eliminated.

- When all the data lines are correct, the program will ask you to "INSERT DISK WITH DOS, PRESS RETURN." Place a disk with DOS in drive 1 and press RETURN. The message "WRITING FILE" will appear and the program will create an AUTORUN.SYS file, printing each data line number as it goes. When the READY prompt reappears, you're ready to play the game. Make sure your BASIC program has been SAVED before continuing.

- To play **Livewire!**, place the disk containing the AUTORUN.SYS file into drive 1. Turn the computer OFF, remove any cartridges and turn the computer back ON. **Livewire!** will load and run automatically.

Playing the game.

It's not every day that you get a chance to venture inside your computer. Prepare yourself, because **Livewire!** pits you against the horrible dangers that lurk inside that seemingly peaceful plastic enclosure.

In **Livewire!**, you are a logic probe on a mission to rid your computer of harmful electronic faults. You sit atop various circuit junctions (which just happen to spell "LIVEWIRE") as the enemies of your computer climb up the circuit lines toward you. There are 64 levels in the game, each one more difficult than the last.

You can use either a joystick or paddle to play **Livewire!**, but a paddle is recommended. Choose the desired controller with the SELECT key, then press START to begin playing.

Use your controller to move along the rim of the circuit. Your controller button fires up to six deadly electron bursts at a time, which destroy the enemy electronic faults on contact. Keep alert, because the enemies can also fire electron bursts at YOU!

In a tight situation, the space bar will destroy all enemy objects on the circuit. Use this weapon wisely, as you are allowed only one use of the space bar "zap" per circuit grid.

Points are awarded for the destruction of each enemy object. The current score is shown at the lower left of the screen. You begin each game with 3 lives (shown to the right of the score), with bonus lives awarded every 20,000 points. The current level number is shown at the lower right of the screen.

The ESC key will pause the game at any time. Press the ESC key a second time to continue game play.

Know your enemy.

The enemies in **Livewire!** are not aliens, monsters or any other tangible threat. They are electronic impulses, out to systematically destroy your computer.



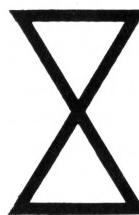
ARCS are clever objects which unpredictably jump from one circuit line to another. They are worth 50 points each.



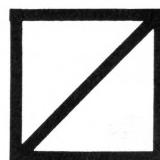
SURGES rise up the circuit grid toward you, then change direction, heading back toward the bottom. If they are not destroyed before they hit the bottom, they create another ARC. SURGES are worth 100 points.



TRANSIENTS are nasty objects which appear and disappear at random as they rise up the circuit. When they are invisible, they cannot be destroyed by your electron bursts, but they can still destroy you! Be particularly careful if the transients become invisible near the top of the circuit. TRANSIENTS are worth 150 points.



VOLTAGE SPIKES aren't particularly dangerous until they reach the top of the circuit. When they do, they turn into SHORTS, described below. If you destroy a VOLTAGE SPIKE before it reaches the top of the circuit, it is worth 200 points.



RESISTANCES are perhaps the most dangerous enemy of all. They CANNOT BE DESTROYED by electron bursts. In fact, any shots which hit them are immediately bounced back at the logic probe! The only way to destroy a RESISTANCE is to use the space bar "zap" feature. When destroyed, a RESISTANCE is worth 250 points.



SHORTS are started by VOLTAGE SPIKES when they reach the rim of the circuit. Up to 4 of these enemies may be present at one time. Shorts are different from other objects in that they follow the rim of the circuit at random. They will destroy you on contact, so be very cautious when they are present. SHORTS can only be destroyed by the space bar "zap" feature, and are worth 400 points.

Final Comments

Livewire! is a difficult game, but it can be mastered. Cautious players will last longer than "daredevils," as is true with most games on the market today. I invite any comments, suggestions or modifications readers care to send in, and will be happy to print useful modifications in future issues. □

Listing 1.

4200 DATA A000F007AD0D2ED024A001BD862E
4A9992C2EBD892E991C2E000A000A99242EA9FF
99142EA91585D1A901990C2E, 84426
1210 DATA A90085842079244A6ABD6E2EF010
205526A6AA0BC742EB94E2E85D0CB9532E85D020
5A25A6AA4C2724BD862E38FD, 89491
1220 DATA 7A2E9D862E3842C91ED004E6E1D0
3AC90A000CB7D42EC903D005A9FF9D7A2EBD74
2EC902D014AD0AD2290148BD, 34796
1230 DATA 802E18792731C90FB0032D802EBD
742EAABD8C2E85842079244C5823A90095E5A9
1585D2BD862E1042BD802EC5, 99572
1240 DATA 95D0086A90185BDD035BD742EC901
D02EA003B9582EF0058810F83022BD802E0A0A
0A0A186908995C2EA9019958, 103946
1250 DATA 2EAD0AD2290199602EAD0AD2293F
99642E4C5B23A6AA0BD802E0A0A0A0A8580BD86
2E4AB015186580A0B9003185, 108404
1260 DATA 8285B3B9A032858385B44C8B2418
65B0A8B9A0311879A1316A858285B3B9A03218
79A1326A858385B4091E38FD, 113958
1270 DATA 862E4429FE000A0A8020089012F9D
912EC8E8E008D0F4A6AA0BD742E00000A850BA9
0885AFAG6ABBDB12E8A3040B9, 119274
1280 DATA 992E85AD089A12E85AEBDD92EA8B9
912E85ACAS5821865008582A5831865A8583A5
ABF00320BC2CA5831865AE85, 125065
1290 DATA 83A5ABF00320BC2CC6AC10D9E6AB
C6AFD0B860A203BD582EF021BC6002EBD5C2E18
792531C9F0B008909D5C2EDE64, 130797
1300 DATA 2E1000DAD0AD2293F9D642E290190
602ECA10D560A000F6A5DA1865DD85D0A84D0A5
D965DC85D984DC0A5D865D0B85, 136620
1310 DATA 0884DBD8208D25A5D8C500D00C20
A325F8A5D01866902D885D068A91085A6A20800
0089D800204026E8E8C8C003, 142456
1320 DATA D0F360A5C8C985F005E6C8202C26
60208A26A207A900100C2ECAD0FAC900D0F2A2
039D582ECA10FAA90008584A9, 147930
1330 DATA 0585AA2079244A6AAA91E9D0862EA9
019D7A2EAD0AD2290F90FF9D79D802EC6AA10
E1A90F8DC0028D01D2AD0AD2, 153150
1340 DATA 291F8D000D290902088326CEC002AD
C0028D01D2D0E8A5C8F014C6C8202C26A93C20
8326A90085BD9A168DC006260, 158188
1350 DATA 68684C7321A990855A6A5C8A20720
4026600050864A6A5A5A20E85A729F05A69D04
21A5A74A4A4A4005A69D0321, 162753
1360 DATA 60A4B5A9000A20E990005C8CAD0F9
A5B3186693D080100A5B418691AA884B5A200BD
402E9900005C8CA10F6A90185, 168020
1370 DATA B66885A3A5A3D0FC600A90085D185
D285D3A2079D00D2CA10FA60A90185A4208A26
A92085C5A900085C6A2039058, 173892
1380 DATA 2ECA10FAA2079D0C2ECAC10FA208B
2C8593A90685BEA5C74A4A4AAAABDBC2D8D0C402
BDC42D8DC502B2DC2D8DC602, 179317
1390 DATA B0A32E85CD45C72907AABD0D42D85
DFBDDC2D85E0BDE42D85E1BDEC2D85E2BDF42D
85E3A204B50F1865E4950FC0A, 186238
1400 DATA 10F6A5CC0A00A0A0A85C985CAAAA9
1085CBB0952F8582BD5F25F8583B0053008585BD
B53085864DC402F00620BC2C, 191816
1410 DATA 201F2DC6CBF007E6CAA6CA4C1927
A6C986CAA30F85CBB0952F8582BD5F25F8583BD
962F85851865826A08590BD6, 197853
1420 DATA F285861865836A859190F38E5CB
859220BE28ADC402F00620BC2C201F2DC6CBF0
07E6CAA6CA4C4B27A6C986CA, 203350
1430 DATA A90F85C0B8593BD553008582BD8530
583BD563088581685826A8590BD86308858618
6583648591A90F38E5CB8592, 208921
1440 DATA 20BE28ADC402F00620BC2C201F2D
C6CBF007E6CAA6CA4C9527A9008597AABD0A31
8D8F31BD0AF318D9F31207728, 214191
1450 DATA A697A0088B98F319DA031E8C8C010
D0F4A697B0A0328D8F31BD0AF328D9F31207728
A697A000B98F319DA032E8C8, 220153
1460 DATA C010D0F4A697B0A033D8F31BD0AF
33809F31207728A697A000B98F319DA033E8C8
C010D0F4A697B0A0348D8F31, 226189
1470 DATA B0A348D8F31207728A697A000B9
F319DA034E8C8C010D0F4A5971869108537C9
F0F0034CD927A93D85C5A903, 231953
1480 DATA 85C6A9000854A60A910859A859394A
659BA9008598A698BD0F31A699187D8F316AA6
9890D8F31A598186590859865, 237537

1490 DATA 9AC911B00C8599A59B18659A8598
4C8428A53A4A859A85994AF005859B4C802860
A59200A8A0A186593AA599, 242533
1500 DATA 9DA031A5919D0A32A5930014A582
9D08J3A5839D034A5859D0F3A59869D0F3460
A9CF8D0002A9208D0102D8A5, 248149
1510 DATA A9F002C6A9A5A3F002C6A3A5B6F0
02C6B6A5BDF0034C002BAA54F0034C62E4ADFC
02C91C0009A5B149FF85B14C, 254446
1520 DATA 5229C921D928A582F024C6B2A205
A9019D682ECA10FAA283BD582EF00EA5DEF818
699485DED8A9009D582ECA10, 259917
1530 DATA EAA9008DFC02A5B1F011A9008D01
D28D03D28D05D28D07D24C62E4A5D1F010C6D1
A6D1BD3E318D02D2BD29318D, 265790
1540 DATA 03D2A5D2F010C6D2A6D2BD68318D
04D2BD53318D05D2A5D3F010C6D3A6D3B08631
8D06D2BD7D318D07D2ADC202, 272029
1550 DATA 1869188DC2028DC30229FC8DC702
C6BF0017AD902E0004A9020992A9008D902EAD
00D2091F293F85BF6EBCA5C, 277192
1560 DATA C930D08A9A900858CE6B7E6B8E6B9
A59DF005C69D4C312AA304859D45CEF006AD7C
024C002AA08402D02FA5BFE0, 283089
1570 DATA 2BA207BD0C8003CDA0F8C6BEA9
019D0C2EA91585D1A3009D2C2EA595D01C2E8A
0A8A0A9D242EA9819D142EA5, 287552
1580 DATA CEF00FAD070024A4A44AC99F3022
A98ED01EA594F005C6944C802BAA9028594AE78
02A595187DFC2D3004C90FD0, 292322
1590 DATA 02A595C595F006A20986D385958A
0A8A0AAA0D0C0290CF007A90185B04C852CBD
A03118693D8D900D4A956BDA0, 297276
1600 DATA 321869208596A9008A20F93F803C8
CA10F9A98F85BAA90085BBA5B7290FAAA5BADD
712F900B00812FB006AABD41, 302643
1610 DATA 2FB5BB05B8220F0005BADD712F90
000D0812FB0008AABD512F05BB85BBA5B89290F0AA
A5BADD712F900DD0812FB0008, 300100
1620 DATA AABD612F05BB85BBA5961865BA38
E9008A8A5B8990004C68A10A1A5A2F005C6A24C
0F2B6E61A90185A2E6A00A50, 313913
1630 DATA 2901A8B9362E859FEBE342E869CA9
03859FB0C2ED0034CE32BA69FB4D489FF023D
3C2E99FF02B900033D03C2E99, 318789
1640 DATA 0003B901031D3C2E990103A69CA5
A12901D08ABD2C2E187D142E902C2EB0142E30
43A005B9682ED039B9E500F0, 322743
1650 DATA 34B9742EC904D005AD902EF028B9
802E0D1C2ED020B9862E4A38FD2C2EF004C9FE
9012B9742EF008A90199682E, 327864
1660 DATA 4CF02B9A9F9D0142E8010BFBD2C2E
F046C910F842187D242EAA0BDA031BCA0321869
40A69F9D04D098186920A894, 333038
1670 DATA D4B9FF021D382E99FF02B900031D
382E990003B901031D3C2E990103C69FC69CA6
9CE49EF0264C242BA9009D0C, 337375
1680 DATA ZEE0029002E6BE0D2C2ED010BD14
E100BB0D1C2EC595D004A98185BD4CE32BE6C2
A5C24A2901A8B9233185C4A5, 342487
1690 DATA C22901A8A90785C1A900855C0A901
85C3B91531859CA900046C38C1731A20991C0C8
C10F0A669C0BD582EF02EBD50, 348107
1700 DATA 2EAA0BDA033BCA03418693EA6C39D
02D09818691C9D1731A8A6C4A900485CFBD1931
91C0C891C0C8CAC6CF10F2C6, 354023
1710 DATA C33007C6C1E69C4C362C8D1ED04C
62E4A9008A9D00039D0004900005900069D000
07C0D0EE60A9008581A90085, 358639
1720 DATA 80A214A0000989100088D0FBCAD001
60E6814CAB2C45830A8580A900208581068026
8106802681068002681068026, 363401
1730 DATA 81A90018658085800A900855818581
A5822903AAA5824A4A85A8A8B1803D172DD01B
2DF015A484BD17D390F2D85, 368094
1740 DATA 8FB0D132D0A4A8180058F918006000
55AAFF3FCFF3FC03000C03401000401A586C583
900B38E583858AA901858CD0, 373251
1750 DATA 08A58338E586858AA9FF858CA585
C582900B38E5828569A901858BD008A58238E5
858589A9FF858BA900858085, 373321
1760 DATA 87A589C58A9008058D858E4A8588
4C762D458A858D858E4A8587A58DF039A58818
658A858C58E900E58838E5, 385091
1770 DATA 8E8588A58318658C8583A5871865
898587C58E900E58738E58E5857A582186588
858220BC2CC68DD0C7600001, 390578

CHECKSUM DATA (See p.46)

```

1 DATA 2,955,686,427,745,192,617,894,4
45,496,549,150,272,322,389,7141
1830 DATA 993,671,940,775,962,932,662,
276,400,422,663,183,693,416,588,9495
1180 DATA 175,598,508,578,666,412,121,
344,64,519,438,515,463,28,305,5735
1330 DATA 390,169,936,204,236,668,846,
422,616,396,89,494,357,417,326,6566
1480 DATA 274,201,274,482,387,131,433,
351,554,524,280,303,292,583,336,5325
1630 DATA 439,58,287,349,291,241,358,4
01,262,869,113,126,272,395,136,4597

```

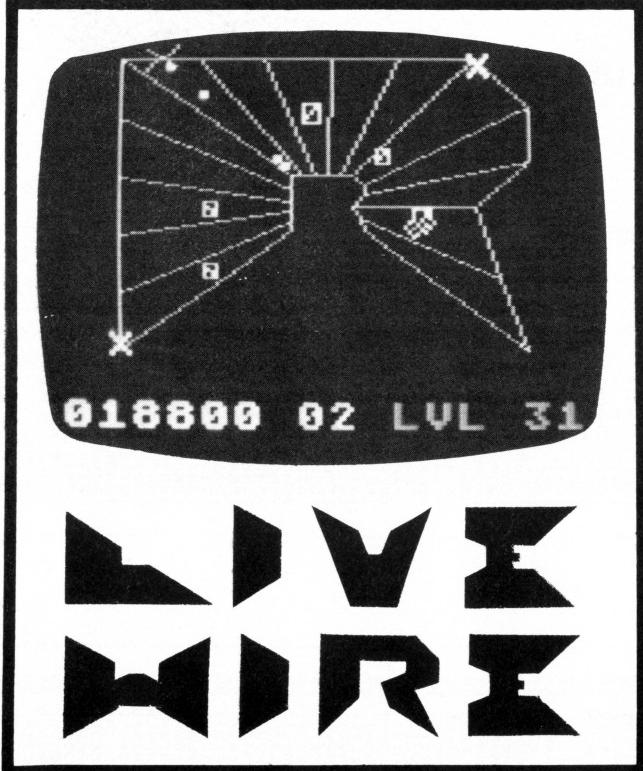
1780 DATA 524,452,916,155,677,686,229,
769,894,892,759,155,902,950,995,9955
1930 DATA 750,717,85,838,937,928,776,5
031

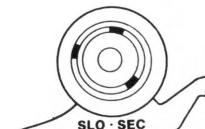
Listing 2.

```
2 REM *** CASSETTE VERSION ***
65 IF PASS=2 THEN CLOSE #1:END
70 ? "READY CASSETTE AND PRESS RETURN"
;:OPEN #1,8,128,"C!":RESTORE 200:FOR X
=1 TO 35:READ N:PUT #1,N:NEXT X
200 DATA 8,36,221,31,255,31,169,60,141
,2,211,169,8,141,231,2,133,14,169,56,1
41,232,2,133,15,169,115
210 DATA 133,10,169,33,133,11,24,96
2000 DATA 00000000000000000000000000000000
0000000000000000000000000000000000000000
00000000000000000000000000000000,439855
2010 DATA 00000000000000000000000000000000
00000000000000000000000000000000,439855
```

Listing 3.

```
2 REM **** DISK VERSION ***
65 IF PASS=2 THEN PUT #1,224:PUT #1,2:
PUT #1,225:PUT #1,2:PUT #1,115:PUT #1,
33:CLOSE #1:END
70 ? "INSERT DISK WITH DOS, PRESS RETU
RN":;DIM IN$(1):INPUT IN$:OPEN #1,8,0,
"D:AUTORUN.SYS"
90 PUT #1,255:PUT #1,255:PUT #1,0:PUT
#1,32:PUT #1,142:PUT #1,49
```





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Street _____
City _____ State _____ Zip _____

MASTERCARD # _____ Exp. date _____
VISA # _____ Exp. date _____

Signature _____

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Assembly Language Listing

Listing 4.

```

LDA #29 ;SET ALL...
LDY #5 ;OBJECTS TO...
INIOBS STA DBJSEG,X ;SEGMENT # 29

BPL INIOBS
JSR SHOSCO ;SHOW SCORE
JSR SNDOFF ;NO SOUNDS
LDA #6 ;6 PROJECTILES
STA PAVAIL ;AVAILABLE
LDA #2 ;SET
STA BONUS ;BONUS=20000
STA LIVES ;2 EXTRA LIVES
JSR SHOLIV ;SHOW LIVES LEFT
LDA #5 ;SET UP...
STA SP2IX ;PLAYER...
LDA #10 ;SHAPE...
STA SP3IX ;INDEXES
STA DLISTL ;POINT TO...
STA DLISTL/255 ;TITLE...
STA DLISTL+1 ;DISPLAY...
LDX #VBI/255 ;POINT TO...
LDX #VBI/256 ;VERTICAL...
LDA #7 ;BLANK...
JSR SETVBV ;INTERRUPT
LDA #PMAREA/256 ;SET UP P/M...
STA PMBASE ;BASE ADDRESS
JSR FMCCLR ;CLEAR P/M
LDA ##74 ;PUT BLUE...
STA COLPF0 ;IN COLOR 0
LDA ##C4 ;PUT GREEN...
STA COLPF1 ;IN COLOR 1
LDA ##0A ;PUT WHITE...
STA COLPF2 ;IN COLOR 2
STA ##34 ;PUT RED...
STA COLPF3 ;IN COLOR 3
STA ##3D ;SET UP...
STA DFACTL ;DMA
LDA #3 ;GRAPHICS,
STA DFACTL ;AND
LDA ##C0 ;INTERRUPT...
STA NMNEN ;ENROLL
LDA ##11 ;SET P/M...
STA PRIOR ;PRIORITY
LDA ##0F ;PUT WHITE...
STA COLPM1 ;IN PLAYER 1
STA COLPM2 ;PLAYER 2
STA COLPM3 ;AND 3
LDA ##16 ;PUT YELLOW...
STA COLPM0 ;IN PLAYER 0

INTRO SCREEN
INTRO LDA CONSOL ;START KEY...
AND #1 ;PRESSED?
BNE CKSEL ;NO'
LDA CONSOL ;START KEY...
AND #1 ;RELEASED?
BEQ BGCHK ;NO, WAIT.
JMP DIGIN ;GO, DIG IN!
LDA CONSOL ;SELECT KEY...
AND #2 ;PRESSED?
BNE INTRO ;NAM, LOOP BACK.
LDA JOYPAD ;TOGGLE...
CLC ;STICK/PADDLE...
ADC #1 ;INDICATOR...
AND #1 ;NO'
STA JOYPAD ;TAX
TAX
LDA JPLO,X ;AND SHOW...
STA CONTRL ;CONTROLLER...
LDA JPHI,X ;MESSAGE...
STA CONTRL+1 ;ON SCREEN
LDA #30 ;30 JIFFY...
JSR WAIT ;WAIT
JMP INTRO ;AND LOOP.

HERE'S WHERE PROGRAM STARTS
DIGIN LDA #DLISTL/255 ;POINT TO...
STA DLISTL ;GAME...
LDA #DLISTL/256 ;DISPLAY...
STA DLISTL+1 ;LIST
LDA #0 ;NO LONGER IN...
STA INTRFB ;INTRO
FOREVR LDA #1 ;WE WANT...
STA COLOR ;COLOR 1
STA ZAP ;RESET ZAP
JSR CLRSC ;CLEAR SCREEN
LDA GRIDIX ;GET GRID#
AND #7 ;FIND WHICH...
TAX ;GRID SHAPE...
LDA GRDTBL,X ;TO DRAW...
STA GRDNUM ;AND STORE
JSR SHOLVL ;SHOW LEVEL#
STA KILPLR ;DRAW GRID
BPL PLIVE ;WE PAUSED?
BNE CONWT ;YUP, LOOP
LDA KILPLR ;PLAYER DEAD?
NOPE!
JSR DECLIV ;ONE LESS LIFE!
PLIVE STA ATTRAC ;CANCEL ATTRACT

NOFEND LDA OBTIMI ;FLASH GOING?
BNE NOFEND ;YES' STORE...
LDA HPDOSPI ;FLASH POSITION
LDA NOOCHAN ;OBJECTS MOVING?
LDA OBJSPD ;NOT YET!
STA OBTIMI ;RESET MOVE...
LDA OBTIMI ;TIMER

COPY OBJECT KILL TABLE
COPDED LDX #5 ;THIS SECTION
LDA ORDEAD,X ;COPIED THE
STA OBD0E2,X ;OBJECT KILL
LDA #0 ;TABLE WHICH IS
STA OBD0EAD,X ;SET UP BY THE
DEX ;PROJECTILE
BPL COPDED ;HANDLER

LDA MISCAD ;MISC SCORE?
BEQ NOMSCO ;NO!
STA SC0ADD+1 ;SET SCORE ADD...
JSR ADDSCO ;AND ADD IT'
LDA #0 ;THEN RESET THE
STA MISCAD ;ADD VALUE
CKOBLV LDX #5 ;THIS SECTION
LDA #0 ;TALLIES ALL
DEX ;OBJECTS THAT
BPL CKOBLV ;ARE ALIVE
LDX #4 ;NOW TALLY
CKOBWT ORA NUMOBJ,X ;ALL OBJECTS
DEX ;THAT ARE NOT
BPL CKOBWT ;ON GRID YET
CMP #0 ;ANY OBJECT?
BEQ LVELND ;NO, END OF LEVEL!

GENNOL LDX #5 ;IS OBJECT
LDA OBJPRS,X ;PRESENT?
BNE NXTDGN ;YES, TRY NEXT.
TRYTYP LDA RANDOM ;LET'S TRY TO
AND #0 ;START UP A
CMP #5 ;NEW OBJECT
BCS TRYTYP ;GET A TYPE
TAY
LDA NUMOBJ,Y ;ANY OF THAT
BEQ NXTDGN ;TYPE WAITING?
SEC ;NO, TRY NEXT
SRC #1 ;INCREMENT #
STA NUMOBJ,Y ;OF OBJECTS
TYA ;WAITING.
NEWGRD LDA OBJTYP,X ;THEN SET
LDA RANDOM ;OBJECT TYPE.
AND #0F ;GET A RANDOM
CMP #15 ;SUB-GRID
BEN NEWGRD ;NUMBER
BEN OBJGRD,X ;AND SAVE IT
LDA #30 ;PUT OBJECT AT
STA OBJSEG,X ;FAR END OF GRID
LDA #1 ;SET UP...
STA OBJINC,X ;OBJ. INCREMENT
STA OBJPRS,X ;OBJECT PRESENT
NXTDGN DEX ;LOOP BACK TO DO
BPL GENNOL ;NEXT OBJECT

JSR OBJHAN ;HANDLE OBJECTS
JSR SHOHAN ;HANDLE SHORTS

NOOCHAN LDA CONSOL ;ANY CONSOLE
CMP #7 ;KEYS PRESSED?
BC0 JCONWT ;NOPE!
JMP LIVE ;RESTART GAME
JCONWT LDA GRIDIX ;INDIRECT JUMP
LYLEND LDA GRIDIX ;ARE WE ON
CMP #63 ;GRID #63?
BEQ NOGARDI ;YES, DON'T INC'
CLC ;INCREMENT
ADC #1 ;GRID #
STA GRIDIX ;AND SAVE IT.
AND #7 ;ADD ? TO
BNE NODIFI ;DIFFICULTY IF
INC DIFF ;ON A MULTIPLE
INC DIFF ;OF 8 GRIDS.
NODIFI BCD NODIFI ;INCREMENT
SED LDA BCDLVL ;BCD LEVEL #
CLC
ADC #1 ;NO GO TO
STA BCDLVL
CLD NOGARDI JMP FOREVR ;DRAW NEW GRID.

OBJECT HANDLER
OBJHAN LDA OBJNUM ;INCREMENT
LDA OBJNUM ;OBJECT #
CLC
ADC #1 ;DONE?
CMP #6 ;NO, CONTINUE.
BNE STONUM ;RESET
LDA #FFF ;OBJECT #
STA OBJNUM ;AND EXIT.
RTS
STONUM STA OBJNUM ;SAVE OBJ #
DBHLPI LDG OBJNUM ;GET OBJ #

```

```

; BY 16...
INC SHAPIX      ;NEXT LINE
DEC SHAPCT      ;LAST LINE?
BNE DOBLP       ;NOT YET!
ENDOBJ RTS      ;ALL DONE!

;-----;
; SHORT HANDLER
;-----;

SHOHAN LDX #3      ;MAX. 4 SHORTS
SHHANL LDA SHORTF,X ;SHORT ALIVE?
BEQ HANNXS      ;NO, DO NEXT
LDY SHORTD,X     ;GET SHORT DIR.
LDA SHORTX,X     ;GET X POS,
CLC             ;AND ADJUST
ADC ADDSUB,Y     ;POSITION
CMP #240         ;ON GRID?
BQS RESSHQ      ;NO! DON'T MOVE
STA SHORTY,X     ;OK, SAVE POS.
DTC SHORTY,X     ;DIRECTION CHANGE?
BPL HANNXS      ;NOT!
RESHDQ LDA RANDOM ;GET A RANDOM
AND #3F          ;DIRECTION TIME
STA SHORTT,X     ;#0-63 & SAVE
DND #1           ;RANDOM DIRECTION
STA SHORTD,X     ;#0-1 & SAVE
DEX             ;MORE SHORTS?
BPL SHHANL      ;YUP!
RTS             ;ALL DONE!

;-----;
; ADD TO SCORE
;-----;

ADDSCO LDY #0      ;GET ZERO
SED             ;SET DECIMAL MODE
LDA SCORE+2     ;THIS SECTION
CLC             ;INCREMENTS
ADC SCOADD+2    ;THE 3-DIGIT
STA SCORE+2     ;SCORE USING
STC SCOADD+2    ;THE 3-DIGIT
LDA SCORE+1     ;SCORE ADD
ADC SCOADD+1    ;AREA, THEN
STA SCORE+1     ;ZEROS OUT
STA SCOADD+1    ;THE
LDA SCORE       ;SCORE ADD
ADC SCOADD      ;AREA USING
STA SCORE       ;THE
STA SCOADD      ;REGISTER
CLD             ;CLR DECIMAL MODE
LSR SHOSCO      ;SHOW SCORE
LDA SCORE       ;GET SCORE AT
CMP BONUS       ;BONUS LEVEL?
BNE NOBONS      ;SORRY!
JSR INCLIV      ;BONUS, ADD LIFE!
SED             ;SET DECIMAL
LDA BONUS       ;GET OLD BONUS
CLC             ;ADD 20000
ADC #2           ;TO IT
CLD             ;CLR DECIMAL
STA BONUS       ;AND SAVE BONUS
NOBONS RTS      ;FINIS!

;-----;
; SHOW SCORE
;-----;

SHOSCO LDA #10      ;SET UP COLOR
STA SHCOLR      ;BYTE FOR SHOW
LDX #0          ;ZERO X
LDY #0          ;& Y REGS
SSCOLP LDA SCORE,Y ;GET SCORE BYTE
JSR SHOBOD      ;SHOW IT
INX             ;INCREMENT SHOW
INX             ;POS. BY 2
INY             ;NEXT SCORE BYTE
CPY #3          ;DONE?
BNE SSCOLP      ;NOT YET!
RTS             ;ALL DONE!

;-----;
; INCREMENT LIVES
;-----;

INCLIV LDA LIVES     ;DO WE HAVE
CMP #5          ;5 LIVES NOW?
BEG NOMOLV      ;YUP, NO INC!
INC LIVES       ;ONE MORE LIFE
JSR SHOLIV      ;SHOW IT
NOMOLV RTS      ;AND EXIT!

;-----;
; DECREMENT LIVES
;-----;

DECLIV JSR SNDOFF   ;END SOUND

;-----;
; WAIT FOR PROJECTILES TO END
;-----;

WAITPD LDX #7        ;8 PROJECTILES
LDA #0          ;ZERO TALLY
CKPRLV ORA PROJAC,X ;CHECK ALL
DEX             ;PROJECTILES
BNE CKPRLV      ;FOR ACTIVITY

;-----;
; STOP SHORTS
;-----;

STPSHO STA SHORTF,X ;TURN OFF
DEX             ;ALL OF 'EM
BPL STPSHO      ;LOOP UNTIL DONE

;-----;
; PUT OBJECTS AT END OF GRID
;-----;

LDA #0          ;ERASE
STA COLOR      ;COLOR
LDA #5          ;ERASE ALL 6
STA OBJNUM      ;OBJECTS
ERSOBJ JSR DRWOBJ ;ERASE IT!
LDX #0          ;GET OBJECT #
STA OBJSEG,X   ;PLACE AT
LDA #3          ;SET #30
STA OBJINC,X   ;SET UP MOVE
RNDDBG LDA RANDOM ;INCREMENT
AND #3F          ;GET RANDOM
CMP #3F          ;SUB-GRID #
BQS RNDDBG      ;#0-14
STA OBJGRD,X   ;DO 'EM
DEC OBJNUM      ;SHOW PLAYER
BPL ERSOBJ      ;DEATH HERE
LDA #0          ;START SOUND
STA COLPM0      ;SET RANDOM
AND #1F          ;DEATH SOUND
STA AUDF1      ;FREQUENCY
LDA #6          ;WAIT 0.1 SEC
JSR WAIT        ;DEC BRIGHTNESS
DEC COLPM0      ;NOW SET
LDA COLPM0      ;DEATH VOLUME
STA AUDC1      ;MORE WAIT
BNE MOREWT      ;DEATH LIVES?
LDA LIVES       ;NO MORE LIFE!
BEQ DEAD        ;ONE LESS LIFE
DEC LIVES       ;SHOW IT
JSR SHOLIV      ;WAIT 1 SEC
LDA #0          ;RESET PLAYER
JSR WAIT        ;KILL FLAG
LDA #0          ;AND
STA KILPLR      ;PLAYER COLOR
LDA #16          ;SET COLOR
STA COLPM0      ;AND EXIT!
RTS             ;ALL DEAD, PULL
DEAD PLA        ;RETURN ADDR.
JMP LIVE        ;AND RESTART GAME

;-----;
; SHOW LIVES
;-----;

SHOLIV LDA #90      ;SELECT DISPLAY
STA SHCOLR      ;COLOR
LDA LIVES       ;GET LIVES
LDX #7          ;17TH CHAR ON LINE
JSR SHOBOD      ;SHOW IT!
RTS             ;AND EXIT

;-----;
; SHOW LEVEL
;-----;

SHOLVL LDY #30      ;SELECT DISPLAY
STY SHCOLR      ;COLOR
LDA BCDDLV      ;GET LEVEL#
LDX #14          ;14TH CHAR

;-----;
; BCD CHAR DISPLAY
;-----;

SHOBOD STA SHOBYT    ;SAVE CHARACTER
AND #3F          ;GET NUM 1
ORA SHCOLR      ;ADD COLOR
STA INFOLN+1,X  ;SHOW IT
LDA SHOBYT      ;GET CHAR.
LSR A            ;SHIFT RIGHT
LSR A            ;TO GET
LSR A            ;NUM 2
ORA SHCOLR      ;ADD COLOR
STA INFOLN,X   ;SHOW IT
RTS             ;AND EXIT

;-----;
; FLASH OBJECT WHEN DEAD
;-----;

FLASH LDY FLASHY   ;GET Y POS.
LDA #0          ;GET READY TO
LDX #14          ;CLEAR OLD FLASH
CLFLSH STA PL1,Y ;ZERO OUT EACH
INY             ;BYTE OF FLASH

```



```

ADC STEP
CMP #17
BCS NOSTEP
STA NEXT
LDA DEST
CLC
ADC STEP
STA DEST
JMP DIVLP1
NOSTEP LDA STEP
LSR A
STA STEP
STA NEXT
LSR A
REQ ENDIV
STA DEST
JMP DIVLP2
ENODIV RTS
; GRID COORDINATE SAVE
GRIDSV LDA GRID
ASL A ;#2
ASL A ;#4
ASL A ;#8
ASL A ;#16
CLC
ADC OFFSET
;ADD THE
;OFFSET VALUE
TAX
SAVE IN INDEX
LDA XWORK
;GET X WORK
STA SEGX,X
;AND SAVE
LDA YWORK
;GET Y WORK
STA SEGY,X
;AND SAVE
LDA OFFSET
;DON'T CONTINUE
BNE SAVEND
;IF OFFSET >0
LDA PLOTX
;GET PLOTX
STA RIMX,X
;AND SAVE
LDA PLOTY
;GET PLOTY
STA RIMY,X
;AND SAVE
LDA DRAWX
;GET DRAWX
STA RIMX+15,X
;AND SAVE
LDA DRAWY
;GET DRAWY
STA RIMY+15,X
;AND SAVE
SAVEND RTS
;ALL DONE!
----- VERTICAL BLANK ROUTINE -----
VBI LDA #DL11&253
;POINT TO
STA VDSLST
;FIRST
LDA #DL11&256
;DISPLAY LIST
STA VDSLST+1
;INTERRUPT
CLD
LDA OBTIMI
;CLR DECIMAL MODE
BFO NOOBTD
;PROCESSES
DEC OBTIMI
;ALL TIMERS
NOOBTD LDA TIMER
REQ NOTIMR
DEC TIMER
NOTIMR LDA FLTIME
REQ NOTIM
DEC FLTIME
NOFTIM LDA KILPLR
BEO CHKINT
JMP VBCONT
CHKINT LDA INTREFB
BEO NOTINT
JMP XITVBV
NOTINT LDA KEY
CMP #1C
BNE CKZAP
LDA PAUFLG
EOR #FF
STA ENDKEY
JMP ENDKEY
CKZAP CMP #21
BNE ENDKEY
LDA ZAP
BEO ENDKEY
DEC ZAP
LDX #5
LDA #1
ZAPOBJ STA OBDEAD,X
DEX
BPL ZAPOBJ
LDX #3
ZAPSHO LDA SHORTF,X
;AND KILL
;ALL SHORTS
REQ NOSKIL
LDA MISCAD
;ALSO SET
;MISCELLANEOUS
SCORE ADD
ADC #4
STA MISCAD
;FOR EACH SHORT
CLD
LDA #0
STA SHORTF,X
;KILL
;SHORT
NOSKIL DEX
BPL ZAPSHO
ENDKEY LDA #
;CLEAR
STA KEY
LDA PAUFLG
BEO NOPAU
;PAUSED?
;NO, CONTINUE
NOPAU LDA #0
STA AUDC1
STA AUDC2
STA AUDC3
STA AUDC4
JMP XITVBV
LDA FIRSOU
BEQ NOFSND
DEC FIRSOU
LDX FIRSOU
LDA FIRSOU
LDA FIRFRO,X
STA AUDF2
LDA OBDCTL,X
STA AUDF3
LDA OBDSOU
BEQ NOOSND
DEC OBDSOU
LDX OBDSOU
LDA OBDFRQ,X
STA AUDF4
LDA OBDCTL,X
STA AUDC3
NUOSND LDA MOVSOU
BEO CYCOL
DEC MOVSOU
LDX MOVSOU
LDA MOVFRO,X
STA AUDF4
LDA MOVCCTL,X
STA AUDC4
CYCOL LDA COLPM2
CLC
ADC #16
STA COLPM2
STA COLPM3
AND #15
STA COLPF3
DEC TRANTM
BNE NOTRAN
LDA ORJHUE+4
BNE TRAN1
LDA #2
BNE STOTRN
STOTRN STA ORJHUE+4
LDA RANDOM
ORA #3F
AND #3F
STA TRANTM
INC PSCNT
LDA PSCNT
CMP #3
BNE NOPSIN
LDA #0
STA PSCNT
INC SP2IX
INC SP2IX
INC SP2IX
NOPSIN LDA PFTIME
BEO FIRE
DEC PFTIME
JMP CHKFMV
FIRE LDA #4
STA PFTIME
LDA JOYPAD
BEO RDSTRB
LDA PTRIG0
RDSTRB LDA STRIG
CMPTRG LDA CHKPMV
LDA PAVAIL
BEO CHKPMV
LUX #7
PRSCAN LDA PROJAC,X
BEO GOTPRN
DEX
BNE PRSCAN
GOTPRN DEC FAVAIL
LDA #1
STA PROJAC,X
LDA #21
STA FIRSOU
LDA #0
STA PROJSG,X
LDA PLRGRD
STA PROGRD,X
STA PROGRD,X
BPL GOSTIK
LDA POTW
LSSR A
LSSR A
LSSR A
LSSR A
CMP #15
BMI STOPOS
LDA #14
BNE STOPOS
GOSTIK LDA PMTIME
BEO RDSTIK
;TURN OFF
;DURING
;THE
;PAUSE
;THEN EXIT
;FIRE SOUND ON?
;NO!
;DEC COUNTER
;PUT IN INDEX
;GET FREQUENCY
;GET CONTROL
;OBJ DEATH SOUND?
;NO!
;DEC COUNTER
;PUT IN INDEX
;GET FREQUENCY
;GET CONTROL
;MOVE SOUND?
;NO!
;DEC COUNTER
;PUT IN INDEX
;GET FREQUENCY
;GET CONTROL
;MOVE SOUND?
;NO!
;DEC COUNTER
;PUT IN INDEX
;GET FREQUENCY
;GET CONTROL
;CYCLE
;PLAYER 2
;COLOR
;SAVE IN P/M 2
;AND IN P/M 3
;ALSO PUT IN
;P/M FOR MISSILES
;TRANSIENT TIME
;TRANSIENT TIME
;NO CHANGE
;FLIP
;TRANSIENT
;HUE
;TO EITHER
;TO DR 1
;RESET
;TRANSIENT TIME
;INC PLYR TIMER
;READY TO
;CHANGE SHAPE?
;NOT YET
;BETTER RESET
;INDEXES
;INDEXES!
;SEE IF WE'RE
;READY TO CHECK
;IF PLAYER IS
;SHOOTING
;RESET FIRE
;TIMER
;USING STICK?
;YES!
;GET PADL TRIGGER
;CHECK IT
;GET STICK TRIGGER
;NOT FIRING!
;ANY PROJ AVAIL?
;NO!
;FIND AN
;AVAILABLE
;PROJECTILE
;1 LESS AVAILABLE
;IT'S NOW
;ACTIVE
;START UP
;FIRE SOUND
;INITIALIZE
;SEGMENT # TO 0
;SET UP
;PROJ GRID#
;AND GRID#
;MULTIPLY
;BY 16
;FOR INDEX
;INITIALIZE
;PROJ INCREMENT
;USING STICK?
;YES!
;GET PADDLE
;DIVIDE BY
;16 TO GET
;USABLE VALUE
;> 14?
;NO GO STORE
;MAX. IS 14
;AND GO STORE
;READY FOR STICK?
;YES!
DEC PMTIME
JMP VBCONT
RDSTIK LDA #2
STA PMTIME
LDX STICK
LDA PLRGRD
CLC
ADC STKADD,X
BMI SAMPOS
CMI #15
IF (<0) REJECT
;IF <15, USE IT
;GET GRID#
SAMPOS LDA PLRGRD
STOPOS CMP PLRGRD
BEQ NOPSTO
LDX #9
STA MOVSOU
LDX PLRGRD
NOPSTO ASL A
ASL A
ASL A
TAX
LDA P0FL
ADC #80C
BEO NOHSHO
LDA #1
STA KILPLR
JMP VBCEND
NOHSHO LDA SEGY,X
CLC
ADC #61
STA HPDOSP0
LDY PLRY
LDA SEGY,X
CLC
ADC #32
STA PLRY
LDA #0
LDX #15
CLRPS STA PL-B,Y
INY
DEX
BPL CLRPS
LDA #15
STA SPIX
AND #0
STA PLYRT
LDA SP1IX
AND #15
TAX
LDA SPIX
CMP SPTBL,X
BCC NOSP1
CMP EPTBL,X
BCC NOSP1
TAX
LDA PN1,X
STA PLTBYT
LDA SP2IX
AND #15
TAX
LDA SPIX
CMP SPTBL,X
BCC NOSP2
CMP EPTBL,X
BCC NOSP2
TAX
LDA PN2,X
ORA PLTBYT
STA PLTBYT
LDA SP3IX
AND #15
TAX
LDA SPIX
CMP SPTBL,X
BCC NOSP3
CMP EPTBL,X
BCC NOSP3
TAX
LDA PN3,X
ORA PLTBYT
STA PLTBYT
LDA PLRY
ADD SPIX
SRC #8
TAY
LDA PLTBYT
STA PL0,Y
DEC SPIY
BPL SPLOOP
BEQ SETPRA
DEC PRADV1
JMC FLIPIT
SETPRA LDA #1
STA PRADV1
;DEC TIMER
;NO, DEC TIMER
;ADVANCE PROJ?
;YES!
;ADVANCE PROJ?
;NO, DEC DISPLAY
;SET ADVANCE
;SET PRADV1
;TIMER
;GET IMAGE BYTE
;PUT IN P/M AREA
;MORE IMAGE?
;YES!
;ADVANCE PROJ?
;NO, DEC TIMER
;GO FLIP DISPLAY
;SET ADVANCE
;SET PRADV1
;TIMER
;THIS SECTION FLIP-FLOPS THE 4
;MISSILES IN ORDER TO ALLOW THE
;DISPLAY OF 8 PROJECTILES. AS
;A RESULT, SOME FLICKER CAN BE
;OBSERVED.
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FLIPIT INC PRFLIP ;INC FLIP INDEX
LDA PRFLIP ;GET INDEX
AND #1 ;MAKE 0/1
TAY ;SAVE IN Y
LDA PREND,Y ;GET # OF LAST
STA ENDVAL ;PROJECTILE
LDX PRSTRT,Y ;GET # OF FIRST
STX VBXHLD ;PROJECTILE
LDA #3 ;START W/MISSILE
STA MISNUM ;NUMBER 3
PROJLP LDA PROJAC,X ;IS PROJ. ACTIVE?
BNE BOTPRJ ;YOU BET.
JMP CKPEND ;TRY ANOTHER
GOTPRJ LDX MISNUM ;GET MISSILE #
LDA PRYHLD,X ;GET LAST POSITION
AND MISL0F,X,Y ;ERASE OLD
STA MISL0F,X,Y ;PROJECTILE
LDA MISL0F,Y ;IMAGE
AND MISL0F,X
STA MISL0F,Y
AND MISL0F,X
LDA MISL0F,Y
AND MISL0F,X
STA MISL0F,Y
LDX VBXHLD ;READY TO
ANN #1 ;ADVANCE PROJ?
BNE NOPADV ;NOT YET
LDA PROJSEB,X ;GET PROJ SEG#
CLC ;AND
ADC PROINC,X ;ADD INCREMENT
STA PROJSS,X ;THEN SAVE
NOPADV LDA PROINC,X ;ENEMY SHOT?
BMI NOHCK ;NO OBJ HIT CHECK
LDY #5 ;ALREADY DEAD?
OBKILP LDA OBDEAD,Y ;YES!
BNE NXTOCK ;OBJECT THERE?
BEQ NXTOCK ;NO!
LDA OBJTYP,Y ;TRANSIENT?
CMP #4 ;NO!
BNE NOTRNC ;INVISIBLE?
LDA OBJHUE+4 ;YES!
BEQ NXTOCK ;SAME GRID #
CMP PROBRD,X ;AS PROJ?
BNE NXTOCK ;NO!
LDA OBJSEG,Y ;SAME SEG #
LSR A ;SEC
SBC PROJSB,X ;AS PROJ?
BEQ HITOBJ ;NO!
BCC #254 ;RESISTOR?
BEG COPRDR ;YES!
LDA #1 ;KILL OBJECT
STA OBDEAD,Y ;AND PROJ.
JMP KILLPR ;PROJ NOW HEADING
LDA #0FF ;FOR PLAYER!
STA PROINC,X ;NEXT OBJECT
NXTOCK DEY ;MORE TO DO!
BPL OBKILP ;MORE?
NOHCK LDA PROJSB,X ;IS PROJ SEG# ==?
BEG KILLPR ;YES, KILL IT!
CMP #16 ;=16?
BEQ KILLPR ;YES, KILL IT!
CLC ;NOW ADD PROJ
ADC PROJGN,X ;GRID INDEX
TAX ;AND GET
LDA SEBX,X ;X COORD
LDY SEGY,X ;AND Y COORD
CLC ;ADD 64 TO
ADC #64 ;X COORD FOR
LDX MISNUM ;P/M HORIZ
STA HPOSMD,X ;AND SAVE
TYA ;GET Y
CLC ;ADD 32 TO
ADC #32 ;Y COORD FOR
TAY ;P/M VERT
STY PRYHLD,X ;AND SAVE.
LDA MISL0F,X,Y ;PROJECTILE IN
STA MISL0F,X,Y ;NEW POSITION
LDA MISL0F,Y
STA MISL0F,X
LDA MISL0F,Y
STA MISL0F,X
LDA MISL0F,Y
STA MISL0F,X
STA MISL0F,Y
CKPEND DEC MISNUM ;NEXT MISSILE #
DEC VBXHLD ;NEXT PROJ.
LDX VBXHLD ;DONE?
CPX ENDVAL ;YES!
BEQ SHORTS ;DO NEXT PROJ.
JMP PROJLP ;KILL PROJ.
KILLPR LDA #0 ;ENEMY PROJ?
BCC NOAVIN ;YES DON'T INC
INC PAVAIL ;ANOTHER AVAIL
NOAVIN LDA PROJSB,X ;SEGMENT 0?
BNE NOKILP ;NO!
LDA PROINC,X ;TOWARD RIM?
BPL NOKILP ;NO!
LDA PROGRD,X ;SAME GRID...
CMP PLRBRD ;AS PLAYER?
BNE NOKILP ;NO!
LDA #1 ;THE PLAYER
STA KILPLR ;IS DEAD?
NOKILP JMP CKPEND ;NEXT PROJ.

;----- THIS SECTION HANDLES SHORTS.
; 2 PLAYERS ARE USED TO SHOW A
; MAXIMUM OF 4 SHORTS, SO SOME
; FLICKER MAY BE OBSERVED.

SHORTS INC SHFLIP ;TOGGLE FLIP
LDA SHFLIP ;MASK FLIP
LSR A ;TO EITHER
AND #1 ;0 OR 1
TAY ;PUT IN Y
LDA CPYSTN,Y ;AND GET IMAGE
STA CPYST ;TO USE (+/X)
LDA SHFLIP ;GET FLIP
AND #1 ;MASK AND'
TAY ;PUT IN Y
LDA #PL3/256 ;PUT PLAYER 3
STA DESTHI ;IN DESTINATION
LDA #PL3&255 ;ADDRESS
STA DESTLO ;HI & LO
LDA #1 ;SET DEST #
STA DESTNM ;GET START
STA VBXHLD ;SHORT #

SHORLP LDA #0 ;ALIVE?
LDY DESTNM ;GET LAST INDEX
LDY SHYHLD,X ;NOW ERASE
LDX #9 ;PREVIOUS
STA (DESTLO),Y ;SHORT
ERSSHO STA (DESTLO),Y ;SHORT ALIVE?
INY ;NO!
DEX ;GET COLOR
BPL ERSSHO ;AND MASK OFF
LDX VBXHLD ;SAME IT
LDA SHORTE,X ;SHORT'S POS.
TAX ;GET X COORD
LDY RIMY,X ;AND Y COORD
CLC ;ADJUST X
ADC #62 ;GET PLAYER#
LDX DESTNM ;AND STORE
STA HPOSZP,X ;ADJUST Y
STA SHYHLD,X ;SAVE IT
TAY ;NOW COPY
STA (DESTLO),Y ;SHORT IMAGE
INY ;TO P/M
STA (DESTLO),Y ;AREA
SHOCOP LDA SHOIMG,X ;DRAW
STA (DESTLO),Y ;CLEAR P/M
INY ;CLEAR
STA (DESTLO),Y ;AREA
DEC CPYCNT ;MORE?
NXTSHO DEC DESTNM ;NO! EXIT!
BMI VBEND ;NEXT PLAYER
DEC DESTHI ;LOOP BACK.
INC VBXHLD ;CLEAR COLLISION
JMP SHORLP ;VBI DONE! (WHEW!)
VBEND STA HITCLR ;DRAW
JMP XITVBV ;CLEAR FROM

PMCLR LDA #0 ;PUT 255
TAX ;ZEROS IN
PMCLP STA MISL0F,X ;EACH P/M
STA PL0,X ;AREA
STA PL1,X
STA PL2,X
STA PL3,X
DEX ;BNE PMCLP
RTS ;FINISH!

;----- CLEAR SCREEN
CLRSC LDA #DISP/256 ;INITIAL
STA HI ;DISPLAY
LDA #DISP&255 ;ADDRESS
STA LO ;WORK AREA
LDX #20 ;CLEAR 20 GROUPS
LDA #0 ;OF 256 BYTES
TYA ;(5120 BYTES)

CLRSC2 STA (LO),Y ;DEY
BNE CLRSC3 ;ZERO OUT:
DEX ;ACCY
BNE CLRSC4 ;X ACCUMULATOR
RTS ;X DELTAX>
CMP DELTAY ;DELTA?
BCC MAXX ;NO!
STA COUNTR ;SAVE DELTAX
STA ENDPT ;IN COUNTR, ENDPT.
LGR A ;DIVIDE BY 2 AND
STA ACCY ;STORE IN Y ACCUM.
JMP DRAWGO ;START DRAW

CLRSC4 INC HI ;MULT. Y BY 32:
JMP CLRSC2 ;GR. 7+ PLOTTER ROUTINE
(SEE A.N.A.L.O.G. #11)

PLOTCL LDA PLOTY ;MULT. Y BY 32:
ASL A ;CLC ;ADDRESS TO GET
STA LO ;ADDC ;THE ACTUAL
LDA #0 ;STA LO ;ADDRESS OF THE
LDA #DISP/256 ;ADC HI ;BE ALTERED FOR
STA HI ;BE ALTERED FOR
LDA PLOTX ;LDA HI ;THE PLOT
AND #3 ;LDA PLOTX ;MASK PLOTX FOR
TAX ;AND #3 ;PLOT INDEX.
LDA PLOTX ;PLACE IN X.
LSR A ;STA PLOTX ;BET PLOTX AND
LSR A ;STA YOFSET ;DIVIDE
LSR A ;STA (LO),Y ;BY 4,
TAY ;LDA (LO),Y ;SET COLOR
AND BMASK2,X ;LDA BMASK2,X ;AND MASK OFF
CMP COLOR1,X ;AND COLOR2,Y ;PIXEL POSITION
BEQ PABORT ;STA HI ;SAME IT
LDY COLOR ;LDA BMASK1,X ;MASK OFF PIXEL
AND COLOR1,X ;OF THE ADDRESS
AND (LO),Y ;STA (LO),Y ;TO BE ALTERED
ORA HOLD,Y ;ORA HOLD, Y ;SET THE PLOT
STA (LO),Y ;BITS AND STORE!
PABORT RTS ;FINISH!

;----- PLOT MASK TABLES
COLORS DB $00,$35,$AA,$FF
BMASK1 DB $3F,$CF,$F3,$FC
BMASK2 DB $C0,$30,$0C,$03
COLOR1 DB $40,$10,$04,$01

;----- DRAW HANDLER
DRAW LDA DRAWY ;DRAWY>PLOTY?
CMP PLOTY ;BCC YMINUS ;IS DRAWY>PLOTY?
SEC ;SUBTRACT
SBC PLOTY ;STA DELTAY ;PLOTY FROM DRAWY
STA DELTAY ;AND SAVE DIFFERENCE.
LDA #1 ;LDA INCY ;Y INCREMENT
STA INCY ;= 1 (DOWN)
BNE XVEC ;BNE XVEC ;BRANCH!
YMINUS LDA PLOTY ;SUBTRACT
SEC ;DRAWY
SBC DRAWY ;FROM PLOTY
STA DELTAY ;AND SAVE DIFFERENCE.
LDA #255 ;LDA INCY ;Y INCREMENT
STA INCY ;= 1 (UP)
XVEC LDA DRAWX ;IS DRAWX
CMP PLOTX ;BCC XMINUS ;> PLOTX?
SEC ;SUBTRACT
SBC PLOTX ;STA DELTAX ;PLOTX FROM DRAWX
STA DELTAX ;AND SAVE DIFFERENCE.
LDA #1 ;LDA INCX ;X INCREMENT
STA INCX ;IS 1 (RIGHT)
BNE VECSET ;BNE VECSET ;BRANCH!
XMINUS LDA PLOTX ;SUBTRACT
SEC ;DRAWX FROM
SBC DRAWX ;STA DELTAX ;PLOTX
STA DELTAX ;AND SAVE DIFFERENCE.
LDA #255 ;LDA INCX ;X INCREMENT
STA INCX ;IS -1 (LEFT)
VECSET LDA #0 ;ZERO OUT:
STA ACCY ;Y ACCUMULATOR
STA ACCX ;X ACCUMULATOR
LDA DELTAX ;LDA DELTAY ;DELTA?
CMP DELTAY ;BCC MAXX ;NO!
STA COUNTR ;SAVE DELTAX
STA ENDPT ;IN COUNTR, ENDPT.
LGR A ;DIVIDE BY 2 AND
STA ACCY ;STORE IN Y ACCUM.
JMP DRAWGO ;START DRAW

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YMAX LDA DELTAY ;DELTAY LARGER,
STA COUNTR ;STORE IT IN
STA ENDPT ;COUNTR, ENPT.
LSR A ;DIVIDE BY 2 AND
STA ACCX ;STORE IN X ACCUM.

; ----
; NOW WE START THE ACTUAL
; DRAWTO FUNCTION!
;

DRAWGO LDA COUNTR ;IF COUNTR=0...
BEGN DRWEND ;NO DRAW!
BEGIN LDA ACCY ;ADD DELTAY
CLC ;TO Y ACCUMULATOR
ADC DELTAY
STA ACCY
CMP ENDPT ;AT ENDPOINT YET?
BCC BEGIN2 ;NO, GO DO X.
LDA BEGINS ;SUBTRACT ENPT
SEC ;FROM Y ACCUMULATOR
SBC ENDPT
STA ACCY
LDA PLOTY ;AND INCREMENT
CLC ;THE Y POSITION!
ADC INCY
STA PLOTY
BEGIN2 LDA ACCX ;ADD DELTAX TO
CLC ;X ACCUMULATOR
ADC DELTAX
STA ACCX
CMP ENDPT ;AT ENDPOINT YET?
BCC PLOTIT ;NO, GO PLOT.
LDA ACCX ;SUBTRACT ENPT
SEC ;FROM X ACCUMULATOR
SBC ENDPT
STA ACCX
LDA PLOTX ;AND INCREMENT
CLC ;PLOT X
ADC INCX
STA PLOTX
PLOTIT JSR PLOTCL ;PLOT THE POINT!
DEC COUNTR ;MORE TO DRAW?
BNE BEBIN ;YES!
RTS ;NO, EXIT!

; ----
; MISCELLANEOUS DATA
;

GRDTBL DB 0,1,2,3,4,1,5,3
; L,I,V,E,W,I,R,E

; COLORS (0=GRID, 1=OBJ1 2=OBJ2)
C0TBL DB $C4,$36,$74,$F6
DB $54,$06,$00,$26
C1TBL DB $80,$0C,$36,$56
DB $26,$C6,$98,$18
C2TBL DB $98,$46,$A8,$36
DB $84,$18,$C6,$38

; OBJECT COUNT TABLES (DIFFICULTY)
OBRCNT0 DB 0,0,0,0,4,6,8,10
OBRCNT1 DB 0,0,0,0,B,9,10,11
OBRCNT2 DB 0,10,12,14,16,18,20,22
OBRCNT3 DB 5,8,10,11,12,14,15,16
OBRCNT4 DB 0,0,4,6,8,10,12,14,16

; STICK ADD VALUES
STKADD DB 0,0,0,0,0,1,1,1
DB 0,$FF,$FF,$FF,0,0,0,0

; PROJECTILE DATA
PROJAC DB 0,0,0,0,0,0,0,0
PROINC DS 8
PROGRD DS 8
PROJON DS 8
PROJSB DS 8
PRSTART DS 7
PREND DS $FF,3
MISLON DB $03,$0C,$30,$00
MISLOF DB $FC,$F3,$CF,$3F

; FLASH (OBJECT DEATH) DATA
FLBYTE DB $28,$28,$28,$92,$54,$28,$10
DB $10,$28,$51,$92,$28,$28,$28
; OBJECT POINTS (250,200,50,100,150)

POINT1 DB $02,$02,$00,$01,$01
POINT2 DB $50,$00,$50,$00,$50

; SHORT DATA
SHORTF DS 4
SHORTX DS 4
SHORTD DS 4
SHORTR DS 4

; OBJECT DATA
OBDEAD DS 6
OBDED2 DS 6
OBJTYPE DS 6
OBJINC DS 6
OBJGRD DS 6
OBJSCD DS 6
OBJHDE DS 2,3,2,3,2
SZEHWK DS 0,0,0,0,0,0,0,0
PXINC DS 0,0,1,$FF,1,$FF,1,$FF
PYINC DS 0,0,1,$FF,1,1,$FF
DRSTBL DB 18,10,4,12
DB 11,10,9,7
OBJDIR DB 4,3,1,2,0,5,$FF,0
DB 4,3,0,6,0,$FF,0,0
DB 0,3,6,4,7,1,$FF,0
DB 6,0,7,1,2,7,$FF,0
DB 4,6,5,7,5,6,4,$FF
OBJLEN DS 3,7,7,7,7,7,0,0
DB 3,7,7,7,7,7,0,0,0
DB 3,3,3,3,3,3,7,0,0,0
DB 2,3,3,3,3,3,3,0,0,0
DB 1,1,1,1,3,1,1,3,0
SIZTBL DB 0,0,0,0,0,0,1,1
DB 0,0,0,1,1,1,2,2,2
DB 0,1,1,2,2,2,2,2,3
DB 0,1,1,2,2,2,2,3,3
DB 1,2,2,2,2,2,2,3,3
DB 1,2,2,2,2,3,3,3,4
DB 1,2,2,3,3,3,4,4

; PLAYER SHAPES
PN1 DB $10,$10,$10,$10,$10,$10,$10,$10

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PN2 DB $08,$08,$08,$08,$08,$08,$08,$08
DB $08,$08,$08,$08,$08,$08,$08,$08
DB $08,$08,$08,$08,$08,$08,$08,$08
PN3 DB $10,$20,$40,$40,$40,$40,$40,$40
DB $10,$20,$40,$40,$40,$40,$40,$40

; SHAPE START/END POINTS
SPTBL DB 0,1,2,3,4,5,6,7
DB 6,7,8,9,4,3,2,1
EPTBL DB 1,16,15,14,13,12,11,10
DB 9,10,11,12,13,14,15,16

; JOYSTICK/PADDLE MESSAGE POINTERS
JPLO DB JOYMSG&255, PADMSG&255
JPHI DB JOYMSG/256, PADMSG/256

; GRID DATA TABLES
CX DB 14,14,14,14,14,14,14,14
DB 26,39,51,64,75,88,100,113
DB 14,14,14,14,14,14,14,14
DB 14,14,14,14,14,14,14,14
DB 14,20,26,32,38,43,49,59
DB 69,78,84,89,95,101,107,113
DB 11,88,64,36,14,14,14,27
DB 27,14,14,14,39,64,88,113
DB 14,14,14,14,14,29,43,58
DB 70,84,98,115,115,113,113,113
DB 113,186,100,113,113,100,82,65
DB 48,52,14,14,14,14,14,14

CY DB 18,34,52,70,88,105,123,141
DB 141,141,141,141,141,141,141,141
DB 18,25,34,42,50,58,67,75
DB 83,93,100,108,116,125,133,141
DB 13,32,39,50,60,69,71,79
DB 141,141,128,150,159,159,159,159
DB 18,18,18,18,18,18,18,18
DB 89,105,124,141,141,141,141,141
DB 18,49,60,111,141,142,153,114
DB 114,123,132,141,141,141,141,141
DB 141,110,80,61,58,18,18,18
DB 18,18,18,43,68,92,117,141

FX DB 35,35,35,35,35,35,35,35
DB 38,60,62,64,66,68,70,73
DB 35,35,35,35,35,35,35,35
DB 35,35,35,35,35,35,35,35
DB 35,37,58,59,59,59,61,63
DB 65,67,68,69,69,70,71,73
DB 73,68,69,69,69,70,71,73
DB 57,55,55,55,60,64,68,73
DB 55,55,55,55,55,55,55,55
DB 65,67,70,73,73,73,73,73
DB 73,72,70,73,73,73,73,73
DB 61,58,55,55,55,55,55,55

FY DB 67,71,74,77,81,84,87,90
DB 90,90,90,90,90,90,90,90
DB 60,62,65,68,71,73,76,79
DB 81,83,86,88,92,94,97,99
DB 67,73,77,80,84,88,90,90
DB 90,90,88,88,88,77,73,73
DB 67,67,67,67,67,71,74,77
DB 80,83,86,90,90,90,90,90
DB 67,74,80,86,90,90,89,87,86
DB 86,87,89,90,86,89,74,67
DB 90,85,80,75,71,67,67,67
DB 67,67,67,73,73,73,73,73

SHSTRT DB 0,2
SHYHLD DS 2
SHOIMD DB $88,$50,$20,$50,$88
$20,$20,$FB,$20,$20
CPYSTN DB 4,9

ADDSUB DB 2,$FF ;ADD/SUB. 2
ADDSBI DB 1,$FF ;ADD/SUB. 1

; SOUND DATA
FIRCTL DB $00,$A1,$A1,$A2,$A2,$A3
$A3,$A4,$A4,$A5,$A5,$A6
$A6,$A7,$A7,$A8,$A8,$A9
$A9,$A0,$A0
FIRFRQ DB 0,154,156,180,152,166
158,152,124,158,110,124
DB 96,110,82,98,68,82
DB 54,68,40

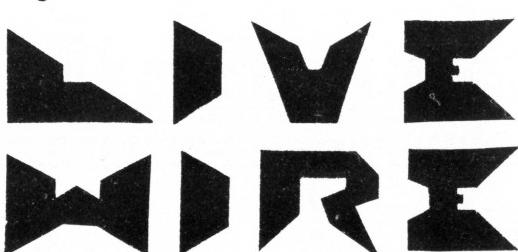
DODCTL DB $00,$41,$41,$42,$42,$43
$43,$44,$44,$45,$45,$46
$46,$47,$47,$48,$48,$49
$49,$49,$49
OBDFRQ DB 0,80,120,120,80,160
120,200,160,240,200,24
240,64,24,104,64,144
DB 104,204,144

MOVCTL DB $00,$A1,$A1,$A2,$A2,$A3
$A3,$A4,$A4
MOVFRQ DB 0,20,30,20,30,20,30,20,30

; DATA TABLES
SEGWK DS 17
SEGX DS 256
SEGY DS 256
RIMX DS 256
RIMY DS 256

; END LIVE

```



AS EASY AS FALLING OFF . . .

THE ALOG PAGEWRITER

For the Atari 400/800 (32K)

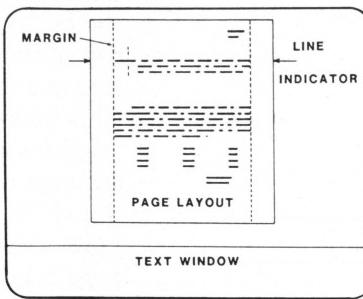
The **ALOG PAGEWRITER** turns your **ATARI** computer and 80 column printer into a very easy to use electronic typewriter. Because the entire page layout is displayed while the user is typing and editing, the **ALOG PAGEWRITER** is ideal for simple word processing tasks such as letters, notes, memos, or the kid's book reports and term papers. The average learning time is about five minutes.

KEY FEATURES:

- Uses standard Atari editing keys (e.g. INSERT, DELETE, TAB, etc.)
- A HELP screen with command summary
- Visible and fully adjustable margins
- FILL command for right justification
- Automatic return option (with word moving)
- Line 'Split' and 'Splice' commands
- Store 10 pages with no disk swapping
- Not copy protected

REQUIRED EQUIPMENT:

- ATARI 400 or 800 Computer
- ATARI 850 Interface Box
- At least 32K of RAM
- One disk drive
- 80 column printer



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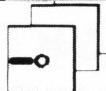
THE ALOG PAGEWRITER STORY

ALOG Computing was formed in July of 1982 by a group of professional scientific computer programmers who felt it might be fun, interesting and possibly profitable to apply advanced programming techniques to the creation of simple, useful and inexpensive software for personal computers.

The ALOG PAGEWRITER is the first of a number of products under development to meet our criteria for release. It is creative, simple, useful and inexpensive. But above all, it's fun. It was fun to develop and it's fun to use. We did it for the ATARI because we wanted to show that the excellent ATARI graphics can be used for more than games.

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by Tony Messina

Several weeks ago I (along with many other ATARI user group members) received a notice about a new word processor which was being offered by ALOG COMPUTING (no connection whatsoever with A.N.A.L.O.G.). The brochure stated the package was easy to use and could be learned within five minutes. I immediately called the publishers for an advanced copy for review and the package arrived within two days. Here are my findings.

The Design

Let me first tell you what the ALOG PAGEWRITER is not. It is **not** a full blown word processor with every conceivable function known to man. The design of the program was never intended to be such and the advertisement states this. With that out of the way, I can say that the ALOG PAGEWRITER is designed for simple word processing tasks such as composing letters, small reports and even small articles for publication (such as this review). As the name implies, the word processor creates documents a page at a time. Simply load the program and start typing. When one page is finished, save it to the disk and continue with the next page. When this is finished save it to the disk, and so on.

Commands/Features

The most unique feature of the ALOG PAGEWRITER is the display of the entire page layout. As you type in the text window, a bit mapped representation of the text appears in the upper graphics window. This lets you see exactly how the page will look when it is printed. In addition there are many commands available to adjust the margins of the page and format the output. All commands are of the form (CTRL) (Letter) If you can't remember which command to use, then CTRL H will produce a help screen which displays all commands and their function. This is a very nice feature to have. Typing in the text requires only familiarity with the standard ATARI editing functions. There are, however, commands which allow you to move the cursor to the top of a page, the beginning or end of a line, set double or single space mode between lines, justify lines, split lines for insertion of text, splice lines to get rid of unwanted spaces and a command to center text on a line.

Layout

When entering the PAGEWRITER from the initial screen, you are presented with a text mode at the bottom of the screen and a graphics mode at the top of the screen. The text window only displays one line at a time. You cannot view an entire document. This keeps things simple and isolates each line. The graphics window displays a simulated sheet of paper (orange outline) with left and right margins (green lines). As you type text, orange dots appear on the page to show the relative word position. As each page is completed it is saved to disk. The maximum number of pages per disk is limited to 10.

The Verdict

The ALOG PAGEWRITER does exactly what it claims to do. It is a well designed, user-oriented software product which is useful for simple word processing tasks. It does require you to read the documentation to become familiar with the commands but one reading will get you started. You may need to refer back to the documentation when implementing a little-used command. The PAGEWRITER supports a wide variety of 80-column printers and requires 32K and a disk drive. The price is \$39.95 but group orders of 5 units or more will cost you \$25.00. If all you plan to do are simple tasks then the ALOG PAGEWRITER is a bargain worth considering. □

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BANK STREET WRITER
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by Arthur Leyenberger

Broderbund Software has recently released a new word processor for the ATARI computer called **Bank Street Writer**. It is billed as "The Home Word Processor" and will probably address the needs of a specific group of ATARI computer owners: The Home User.

At first glance, **Bank Street Writer (BSW)** looks like a powerful and easy to use piece of software. Let's look at what features a "home user" would require in a word processor and use these as criteria to evaluate **BSW**. In this way, you will be able to judge **BSW** for yourself.

A major use of a "home" word processor is to write letters. **BSW** allows top, bottom, left and right margins to be specified either just prior to printing or permanently with its utility program. Automatic paragraph indenting is accomplished by simultaneously pressing the CONTROL key and the letter "I". Page ejects may be viewed before printing and adjusted as necessary. Most of the features that a home user would require to write letters are available.

Some of the desirable letter-writing features not supported are: underlined text, right justification and block right capability. These absent capabilities do not prevent **BSW** from being useful for writing letters.

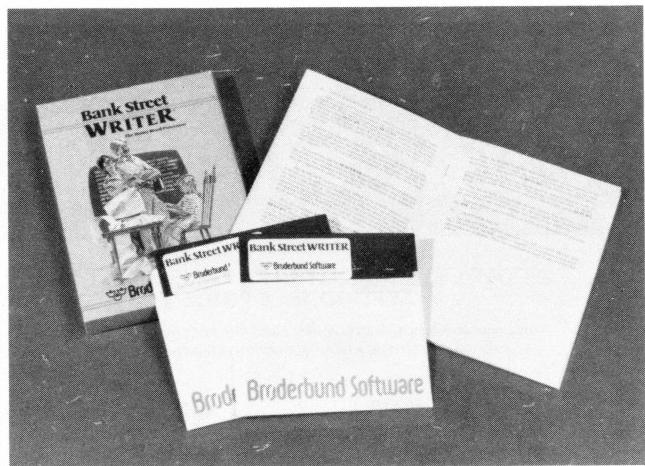
The second major use of a home word processor is to prepare reports and term papers by students. In addition to the features needed to write letters, the following capabilities are required: the ability to center text for making titles; page numbering and page headers (a one-liner that appears at the top of every page of the document except the first page); and finally, editing the text once it is written should be easy to perform and the program should prevent the user from making errors. **BSW** has all of these capabilities.

One of the strongest features of **BSW** is its ease of editing. For example, if the user wants to erase a block of text, the ERASE option of the main menu is selected. Then the cursor is sequentially positioned at the beginning and at the end of the block of text to be erased. Next, the computer highlights (with inverse video) the text in question and prompts, "Are

you sure you want to erase the highlighted text?" If the user answers yes the text is removed. Any other response is taken as a "No". Should the user suddenly realize that he did **not** want to erase the block of text after the the text was removed, all is not lost. The UNERASE option of the main menu is selected and the missing text is restored.

The MOVE and MOVEBACK commands allow the user to shift blocks of text (up to 15 lines at a time) back and forth as a unit within the document. The same highlighting and query messages that appear with ERASE and UNERASE are used. Both the UNERASE and MOVEBACK commands only work on the last block of text accessed. Previously moved or erased text cannot be recovered.

Some additional features that are useful for writing reports are, regrettably, absent. Footnoting is not possible since superscripts are not supported. There is no method for passing printer control codes to the printer from either within the body of the text or elsewhere. This means that alternate type fonts such as bold face, italics or condensed printing can not be selected (assuming your printer has these capabilities). The only printer codes that are user selectable are the line feed/carriage return and form feed codes.



There is one feature of **Bank Street Writer** that makes it unique among the currently available word processors for the ATARI computer. This is the tutorial program that comes on the flip side of the disk. Unlike the word processor program itself which is written in **BASIC A+** (by Optimized Systems Software), the tutorial requires the ATARI **BASIC** cartridge to be installed. The tutorial covers the main functions of **BSW**. The first section explains text entry, capital letters, the return key and the wrap around feature. Wraparound allows the user to continue typing past the end of the 38 character line while the computer moves the excess words forward to the next line. Used instead of the carriage return on a typewriter, the wraparound function is a standard feature on almost all word processors.

The final portion of the tutorial program deals with the MOVE, MOVEBACK, ERASE and UNERASE functions. The tutorial is interactive in that it not only describes how a function works, but also requires the user to try it for themselves. In this way, the user gets hands-on experience using the program. Unfortunately the tutorial does not demonstrate the transfer functions (loading, saving, and printing documents). These are covered only in the manual.

Bank Street Writer uses a 38 character by 18 line screen. The maximum document size is approximately 2300 words (with the BASIC cartridge removed) which translates into roughly a nine page document. Since the program is written in BASIC it is not particularly fast. This is no problem when the document length is less than 3 pages. However, as the size of the document grows, the time it takes to switch from the "write" mode to the "edit" mode increases.

I began writing this review using **Bank Street Writer** itself. After about five 18-line screens (about half of this review) it was taking from 4 to 7 seconds to

scroll up one line! At one point I measured 17 seconds to go from the "write" mode to the main menu. It was at this point that I pulled the plug and switched to **Letter Perfect** (LJK Enterprises) to complete the review. My main complaint with this lengthy response time lies with its effect on the first time computer user. If a child's first exposure to using a computer for serious activities (like word processing) results in the perception that a program that is easy to use must also require a lengthy response time, then that child is being done a disservice.

In spite of its shortcomings, **BSW** is the easiest word processor program to use for the ATARI computer. It is inexpensive, there is good error protection, the manual is clearly written and well organized, and two copies of the program are provided. The current version is incompatible with the ATARI 1200XL computer.

Bank Street Writer has almost everything going for it — it is up to the user to decide if it goes far enough. □

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FINE SCROLLING ON THE 1200XL

Here's an interesting trick for owners of the ATARI 1200XL — automatic fine screen scrolling in graphics mode 0!

This type of scrolling adds an interesting touch to text-oriented programs, eliminating the normal "jumping" nature of screen scrolling.

The program listed below is a short demonstration of the fine-scrolling ability of the 1200XL. Type it in and RUN it.

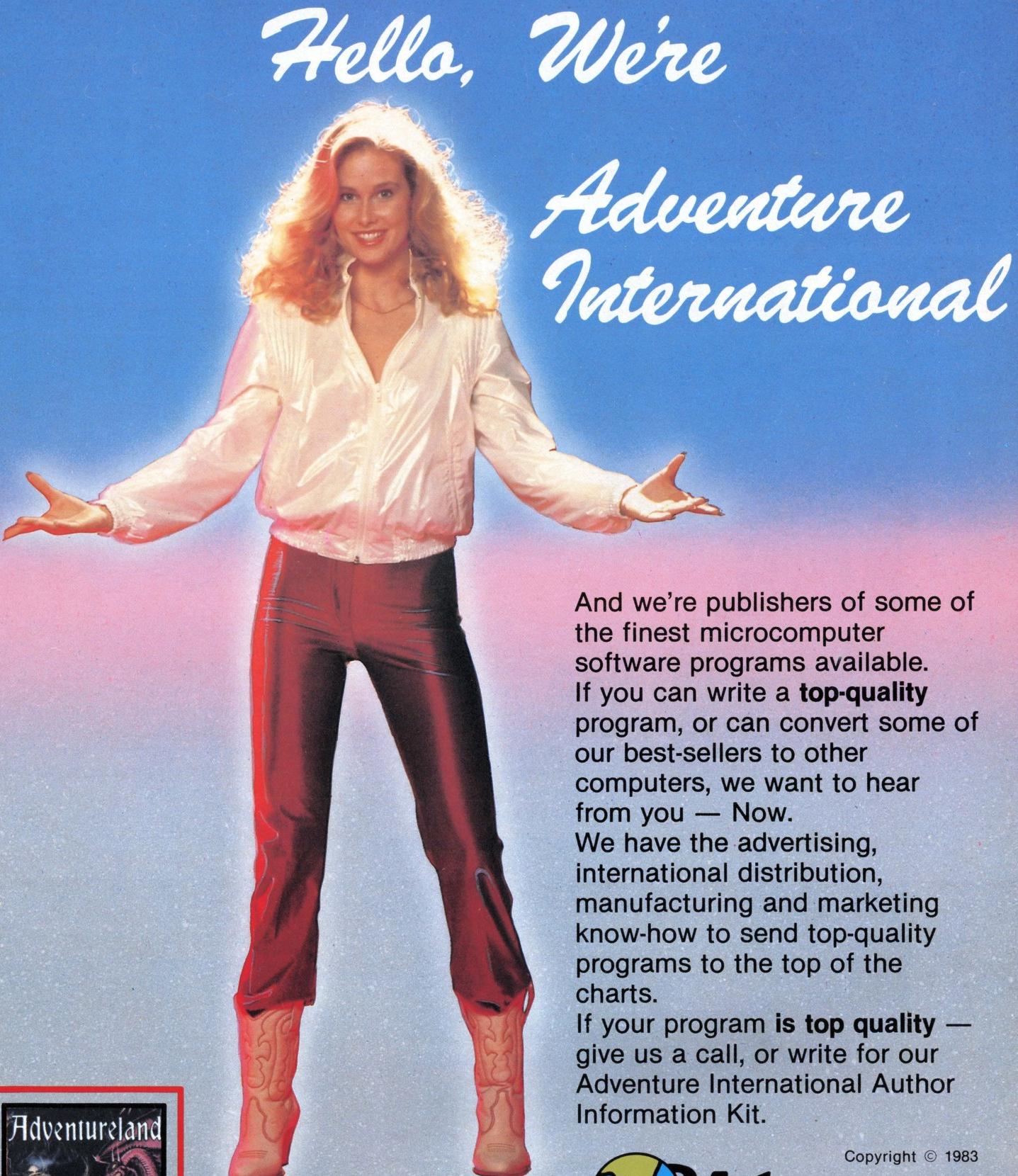
```
10 POKE 622,255
20 GRAPHICS 0
30 ? "FINE SCROLLING"
40 GOTO 30
```

You will notice that the program prints a message in an infinite loop. When the message fills the screen, the fine-scrolling mechanism starts.

To use this technique in your own programs, all you need are two commands: POKE 622,255 and GRAPHICS 0.

The POKE command to location 622 tells the system to use fine scrolling. By POKEing a zero here the scrolling can be turned off again if you like. The GRAPHICS 0 command is necessary to start the scrolling handler.

That's all that is needed! You can even use these two commands from BASIC's immediate mode if you like.



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YOU'VE GOT FROM NOW 'TIL THE END OF THIS PAGE TO BECOME MOUNTAIN KING.

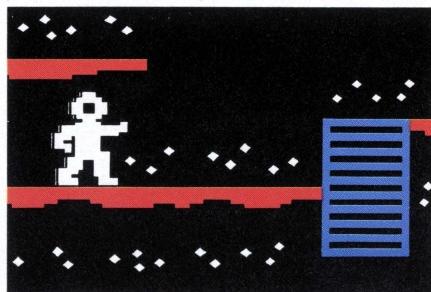
GO!

See all those
glittering diamonds?
Grab 'em.

You need 1,000 diamonds fast.
To score, you have to
burrow deep. Deep
into the caverns.

You craftily cop a dozen
jewels. Then, jump to the ledge
below. Then down to another. And
another. But, STOP!

There's nothing but an abyss
below. Nothing for you there except
a bad fall—and even worse, delay!



Quick—down another ladder.
Listen!

Ghostly music
floating
through the
black tunnels.
That means
the Flame Spirit
is hiding nearby.

The music grows louder as you
draw closer.

Now softer (quick, go back the
other way). Louder again. Shine your

No, don't
go there.
You've already
stripped that
vein of diamonds.
Go where no one
has ever dared
venture before.

Follow the caverns.
Deeper and deeper.

Down the ladders. Over to
the right—more jewels...and
CURSES!...you've fallen.
And you're losing time.

Grab those diamonds.
Ah ha! You've reached 1000!
The Flame Spirit has been set free.
Now you must capture it.

There
it is. Now,
kneel
before the
Spirit and
grab it.
Gotcha! Run!
Run to the
Temple. Watch out! Behind you!
A vampire bat trying to
steal the Flame Spirit. Climb down,
below the ledge. Another bat!

Down. To the very bottom of the
mountain.

To the pit. And the darkness.
Lit only by the shimmer of
diamonds. Suddenly there's a rush of
movement...a giant spider—after you.

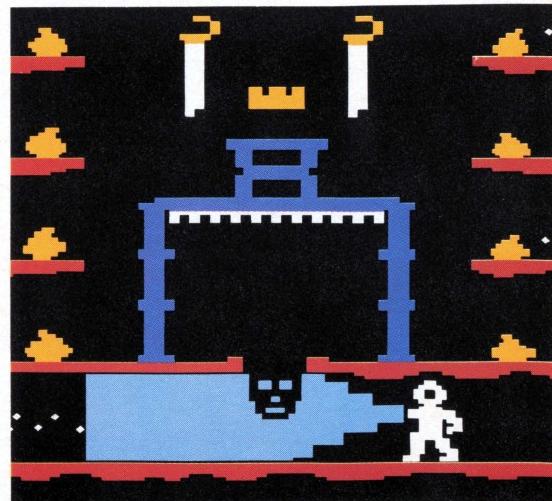


Run. Jump. Up to the ledge. Hurry!
Jump again!

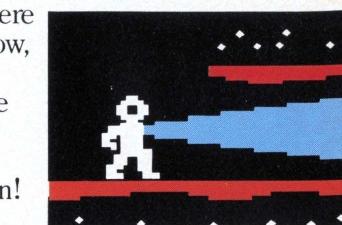
Aarrrgggghhh! You're caught.
Woven in a tangled web. Hurry,
break loose before he returns and
you're devoured.

Ah! You've freed yourself. You've
lost time, but you've gained character.

Now, on to the Temple.
But beware of the guardian flames—one
false move and you'll end up charred
...and out of the game! Get to the
Temple Portal, the Spirit in your
grasp. Shine your light on the giant
guardian skull. You kneel. (Not out of
respect, but out of need—for without



flashlight.
The Flame Spirit
is very near.
A flicker. Out of
the corner of your eye.
Shine that light!



There
it is. Now,
kneel
before the
Spirit and
grab it.
Gotcha! Run!
Run to the
Temple. Watch out! Behind you!
A vampire bat trying to
steal the Flame Spirit. Climb down,
below the ledge. Another bat!

Down. To the very bottom of the
mountain.

To the pit. And the darkness.

Lit only by the shimmer of
diamonds. Suddenly there's a rush of
movement...a giant spider—after you.

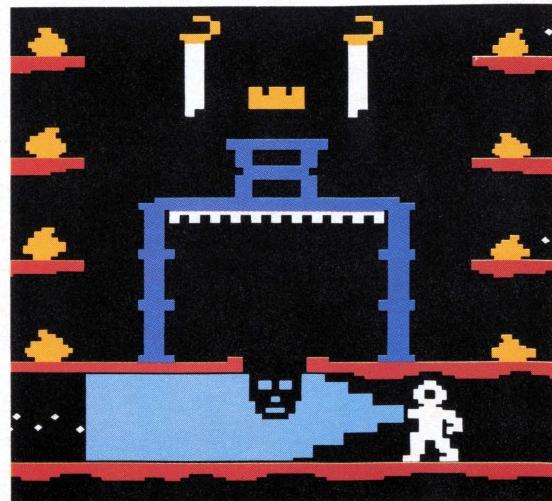


Run. Jump. Up to the ledge. Hurry!
Jump again!

Aarrrgggghhh! You're caught.
Woven in a tangled web. Hurry,
break loose before he returns and
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Ah! You've freed yourself. You've
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Now, on to the Temple.
But beware of the guardian flames—one
false move and you'll end up charred
...and out of the game! Get to the
Temple Portal, the Spirit in your
grasp. Shine your light on the giant
guardian skull. You kneel. (Not out of
respect, but out of need—for without



kneeling,
entering the
Temple is forbidden.)

The entrance yawns open. And you leap in. There, enshrined deep within the

sacred Temple, emblazoned with gold, is the sovereign crown. You must get that crown. Without it, you cannot become

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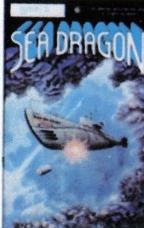
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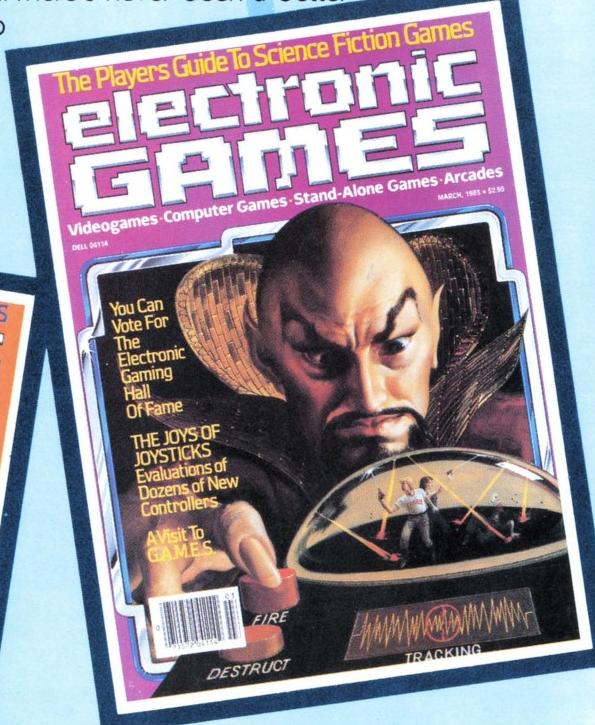
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INDEX TO ADVERTISERS

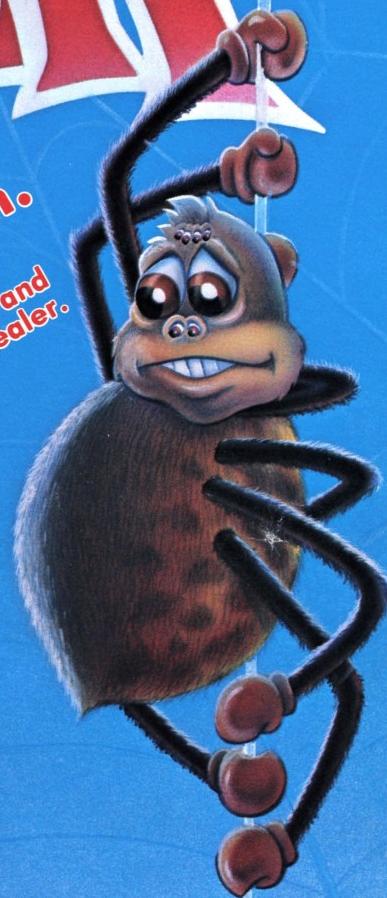
Adventure International	29, 106, 127, 130, OBC
Alien Group	26
Allen Macroware	38
ALOG	123
Amulet	22
Austin Franklin	28
CAP Software	126
CBS Software	128, 129
CDY	83
CE Software	83
CompuClub	72
Compsoft	86
Computability	15
Computer Alliance	115
Computer Creations	54
CompuWare	115
Convologic	22
Don't Ask Software	12, 74
Dorsett	60
Eastern House	102
Educational Software	69
Elcomp	68
Electronic Connexion	54
Electronic Games	131
ESD	38
Financial Software Plus	100
G.A.M.E.S.	37
Happy Computing	27
I.J.G.	83
Infocom	2, 3
I.S.	99
J.E. Koch & Co.	13
Leading Edge	1
LJK	4
Macrotronics	97
Micro Mainframe	47
Microprose	19
Microtronics	75
Mighty Byte Computing	34
Miles Computing	97
MMG Micro Software	109
Monarch Data Systems	38
Mosaic	IFC
Neotechnic	83
On-Line Computer Centers	33
One Stop Software	37
OSS	7
PMI	39
Poire Peripherals	12
Polly Products	74
Rampage	53
Romox	64, 65
Royal Software	89
Shifter	124
Sierra On-Line	IBC
Softraiders	10
Software Plus	42
Software Publishing	51
Software Gallery	123
SSI	23
Synapse	103
Task Force Games	20
Tech II	126
TMQ	63
20th Century Fox Games	66, 67

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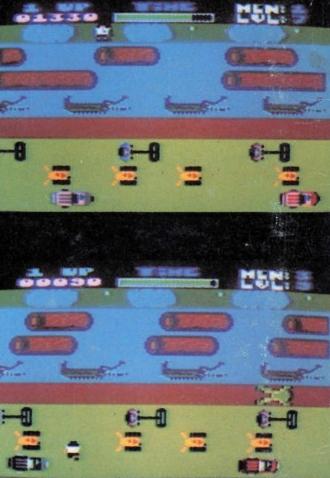
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